ANNALS

OF THE

ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. II.

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ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. II.

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BOTANICAL
GARDEN.

THE SPECIES OF ARTOCARPUS INDIGENOUS TO BRITISH INDIA;

THE INDO-MALAYAN SPECIES OF QUERCUS AND CASTANOPSIS.

BY

GEORGE KING, M.B., LL.D., F.R.S., F.L.S.,

Superintendent of the Royal Botanic Garden, Calcutta,

Brigade-Surgeon, Indian Medical Service.

CALCUTTA:
Printed at the Bengal Secretariat Press.
1889.

TO HIS EXCELLENCY THE MOST HONOURABLE

Henry Charles Keith Petty-Fitzmaurice, Marquis of Lansdowne,

G.M.S.I., G.C.M.G., G.M.I.E.,

VICEROY AND GOVERNOR-GENERAL OF INDIA,

THIS ATTEMPT TO ILLUSTRATE A SMALL PORTION OF THE FLORA OF THE PROVINCES

UNDER HIS GOVERNMENT

IS MOST RESPECTFULLY DEDICATED

BY HIS EXCELLENCY'S FAITHFUL AND OBEDIENT SERVANT

GEORGE KING.

Royal Botanic Garden, Calcutta,
December 1889.

ERRORS AND ADDITIONS.

SINCE the part of this book relating to Artocarpus was printed off, I have learnt from Sir Joseph Hooker that truly wild specimens of the jack-fruit, *A. integrifolia, Linn. fil.*, were collected in the forests of the Western Ghâts in the Deccan Peninsula by Colonel R. H. Beddome. In consequence of this interesting discovery, this species must be added to the seventeen described by me.

On p. 1, line 16, for "*Fosterian*" read "*Forsterian.*"

On p. 22, sixteenth line from the bottom, after the words "*oblong-lanceolate,*" insert "*or ob-lanceolate*"; and in the fifth line from the bottom, for "6 *in.*" read "·6 *in.*"

On p. 47, eighth line from the bottom, for "*Q. pyrifolia, Bat. Bl.*" read "*Q. pyrifolia, Bl.*"

On p. 65, in first line of sixth paragraph, delete the words "*and especially to its var. latifolia.*"

On p. 79, fourteenth line from the bottom, for "*Castanopsis lanceæfolia,* Kurz" read "*Castanea lanceæfolia,* Kurz."

On plate 27, *Quercus lineata,* Bl., for "9 *to* 12 var. *Hilldebrandii*" read "10 *to* 12."

THE

SPECIES OF ARTOCARPUS

INDIGENOUS TO BRITISH INDIA.

THE genus *Artocarpus* was first published by the brothers Forster in their *Characteres Generum Plantarum* issued in 1776, and it was founded on the well-known Bread fruit tree, which these botanists named *Artocarpus communis*. The elder Linnæus, to whom the authorship of the genus has by some authors been erroneously attributed, nowhere describes it. In fact, its first appearance in any of the Linnæan writings is in the Supplement to the *Systema*, published in 1781 by the younger Linnæus, who, adopting Forster's name for the genus, described the Bread-fruit as *A. incisa* and the Jack as *A. integrifolia*. Such striking trees as the Bread-fruit and the Jack had not, however, escaped the notice of other European botanists until so late as 1781; for we find that in the very year of Forster's publication of *Artocarpus*, Thunberg, under the generic name of *Radermachia*, described, in the 36th volume of the *Proceedings of the Stockholm Academy*, the two species *integrifolia* and *incisa*. Gærtner, in his treatise *De Fructibus et Seminis Plantarum*, published in 1788, gave a description and figures of the Jack under the genus *Sitodium* (the authorship of which he attributes to Banks), and with the specific name *caulorum*. Lamarck, in the third volume of the *Encyclopédie Methodique*, dated 1789, enumerates five species under the Fosterian generic name, viz. *A. incisa*, *heterophylla*, *Jaca*, *Philippensis*, and *hirsuta* (the *Ansjeli* of Rheede). Lastly, the Abbé Loureiro, who had been familiar in Cochin-China with the Jack as a tree cultivated for its fruit, formed for it, in his *Flora Cochin-Chinensis*, published in 1793, a genus which he called *Polyphema*. In this genus he included, besides the Jack (*P. Jaca*), an indigenous species which he called *P. Champeden* (= *Artocarpus Polyphema*, Pers.).

By the pre-Linnæan writers the Bread-fruit and Jack had been described and figured. Rumphius (*Hort. Amboinensis*) described various forms, of which these are clearly two, under the general name of *Soccus*. What the other species were, it is difficult to make out from the rude figures and descriptions of this writer, and the enquiry would hardly repay the trouble. In Rheede's *Hortus Malabaricus* (vol. iii, p. 17, tab. 26—28), *A. integrifolia* is described and figured under the name *Tsjacca Marum*.

Rheede, in the same book (p. 25, t. 32), describes for the first time, under the name *Ansjeli*, a fourth species of *Artocarpus* (*A. hirsuta*, Lamk.). In Sonnerat's *Voyage to New Guinea* (p. 29, t. 57—60), the Bread-fruit is described and figured as *Rima.*

Amongst post-Linnæan botanists the first considerable additions to the genus were made by Blume, who, in his *Bijdragen* (published in 1825) described for the first time the four species *pubescens*, Bl. (not of Willd. and = *A. Blumei*, Trec.); *elastica*, Reinw. (probably only a form of *A. incisa*); *rigida*, Bl.; and *glauca*, Bl. Roxburgh, in his *Flora Indica*, published in 1832, added to the genus three species not previously described, viz. *Lakoocha*, Roxb., *Chaplasha*, Roxb., and *lanceæfolia*, Roxb.; while, under the specific name *hirsuta*, Lamk., he described the *Ansjeli* of Rheede, and under that of *echinata*, Roxb., he re-christened the previously-described *A. rigida* of Blume. The next contribution of importance to the botany of this genus is contained in a paper on the *Artocarpées* published by Trecul in 1847, in the *Annales des Sciences Naturelles*, ser. iii, vol. 18. In this paper Trecul gives a revision of the genus, arranging the fifteen species of which he had seen good specimens into two groups, which he called *Jaca* and *Pseudo-Jaca.* Of the fifteen species described in that paper, six are described for the first time, namely, two Malayan (*Gomeziana*, Wall., and *glaucescens*, Trec.); three from the Philippines (*Cumingiana*, Trec.; *nitida*, Trec.; and *lanceolata*, Trec.); and one from the Ladrones (*Mariannensis*, Trec.). Four species, namely, *glauca*, Bl., *pubescens*, Willd. (= *hirsuta*, Lamk.), *laevis*, Hassk., and *lanceæfolia*, Roxb., Trecul had never seen, and these he does little more than enumerate. Of the second and fourth of these four there are excellent specimens in the Calcutta Herbarium, and they are evidently perfectly good species. Of the first and third I have as yet seen no authentic specimens.

Miquel is the next botanist who contributed to any considerable extent to our knowledge of this genus. In his *Catalogue of Zollinger's Plants*, his *Flora of Netherlands India* (vol. i, pt. 2), in his Sumatran Supplement to the same work, and in the third volume of the *Annals of the Leiden Museum*, this author describes no fewer than twenty-two new species from the Malayan regions. A large number of these new species were, however, founded on such imperfect material that, from Miquel's *descriptions* alone, it is simply impossible to identify his plants; and it is only by inspection of the actual material on which the author worked, and which is contained in the Herbaria at Leiden and Utrecht, that it is possible even to guess what these species are. Descriptive botany of this sort is worse than useless, for it imports elements of doubt, confusion and uncertainty into all subsequent determinations; and it is much to be regretted that Miquel did not allow the imperfect Malayan material to lie undescribed until such time as it could be supplemented by completer specimens. That this might possibly not have been accomplished during his own lifetime, was a consideration which should have had no weight with a botanist of Miquel's calibre and standing. Besides these described by the authors already mentioned, species of *Artocarpus* were described by Zollinger (1 species), Thwaites (1 species), Hasskarl (1 species), Teysmann and Binnindyk (1 species), and Kurz (1 species).

Artocarpus is a monœcious genus. The flowers are small and strictly unisexual, and those of each sex are collected on the convex surface of fleshy or semi-woody receptacles. These receptacles vary from globose to oblong; they are axillary, either sessile or pedunculate, and have but rarely any involucres or bracts at their base. The male receptacles are, as a rule, much smaller than those bearing the female flowers, and they usually occupy the axils of the younger leaves: they are soft and spongy in structure, and rapidly disappear after the maturation of the pollen. The female receptacles, when ripe, often attain an enormous size; those of the Jack sometimes measuring three feet in length and fifteen inches in diameter. The core of the receptacle in many species is hard and woody at first, becoming only moderately soft even when the anthocarps are ripe. In others, the substance of the receptacle is soft from the first. The surface of the syncarpium varies from spiny to smooth, according as the anthocarps borne on the receptacle are united for part or for the whole of their length. The structure of the individual flowers is very simple, and Forster's original account of it shows that, from the first, it was pretty accurately understood. The male flower has a very simple perianth, composed usually of two pieces. In a few of the Indo-Malayan species these pieces are bifid at the apex; and in one species this division is continued to the very base, so that the perianth becomes 4-leaved. The pieces are valvate or very slightly imbricate in bud. The flowers have only a single stamen, which has a straight, non-elastic, filament; the anther is ovate or sub-reniform, 2-celled, and is exserted while the pollen is being shed. The male flower contains no rudiment of a pistil. Attached to the receptacle between the male flowers there are, in many species, curious and beautiful scales. These scales resemble nails with broad heads. The peltate head is usually ciliate, on the edges at least; sometimes it is 3-lobed, but usually it is circular. The pedicels of these heads in some species are thickened upwards; in others they are uniformly filiform. In some species (e.g. *hirsuta*), the scales are flat, ligulate, and not peltate; and, in many species, scales are absent from the male even when present in the female receptacle. The female flowers, like the males, are closely packed together on the convex surface of a receptacle. The perianth (which is tubular) is originally united to the receptacle by its base, and to its neighbours on each side for a greater or less part of its length. The apices of these perianths become indurated as they ripen; and each, becoming more or less consolidated with its ovary, forms an anthocarp. And it is the amount of union that takes place between the individual anthocarps which determines whether the surface of the mature syncarpium is spiny, tubercular, or perfectly smooth. In cases where the ripe syncarpium is spiny, the upper part of the tubular perianth of each flower is free and cylindric or conical; in cases where the surface of the ripe receptacle is tubercular, the free part of the individual anthocarp is shorter, broader, and has a blunt apex: while, in those where the surface of the ripe syncarpium is smooth, the individual anthocarps are united into a fleshy mass from base to apex. In all three cases, however, the apex of the individual anthocarp remains perforated, so that the stigma can pass out to the open air. Each female flower contains only a single ovary, which is free, and, as has been indicated, its style (which is cylindrical) passes upwards through the tubular perianth, so that its upper part also is carried out into the open air, this upper part being well supplied with stigmatic tissue. I have never met in this genus with the peltate stigma mentioned by some writers. The single ovule is pendulous. As both the anthers and stigmas are well exserted when mature, the mechanism of fertilisation must be very simple. Only a few, however, of the ovules in any syncarpium develope into seeds: those which do thus develope being enclosed in a membranous or coriaceous anthocarp. The perianths of the unfertilised flowers remain distinct until a very late period, and can be distinguished, on dissection, even up to the time when seeds are nearly ripe. The seeds are pendulous and have a membranous testa; they are exalbuminous, the cotyledons being thick and fleshy. Peltate scales, of the sort already described, occur on the female receptacle.

The leaves of *Artocarpus* are alternate, coriaceous, and penninerved; for the most part entire, but in a few species coarsely lobed. When dried, they much resemble those of *Ficus*, as to some extent do the stipules; and when fructification is absent, herbarium specimens of the two genera are not readily distinguishable. Thus Miquel originally described his *Artocarpus Tampang* as *Ficus Tampang;* and I have seen, in several collections, fruitless specimens of *Artocarpus Gomeziana* named *Ficus scleroptera*, and *vice versâ.* Stipules are invariably present; and in all the British-Indian species there is a pair of these at the base of each leaf. In some species the stipules are very large and embrace the young leaf-buds; in others they are small and insignificant: but in all cases they are deciduous. All the species are trees, and all have milky juice.

Trecul, as has been already indicated, divided the genus into two sub-genera,—*Jaca* and *Pseudo-Jaca.* The characters of his *Jaca* are—"*male perigonium of* 2 *leaves, more or less cohering together; stipules* 2, *opposite, amplexicaul, the one infolding the other by its margins;*" and of his *Pseudo-Jaca*—"*male perigonium* 4- *rarely* 3-*phyllous; stipules* 2, *minute, axillary or sub-lateral, neither opposite nor amplexicaul.*" As regards the male perianth, it is quite true that in *A. Denisoniana*—a species, by the way, which Trecul never saw—the two pieces of the male perianth are cleft to the base, and that the perianth thus becomes 4-leaved; but the arrangement obtains in no other British-Indian species. Trecul states that in *A. Lakoocha* the male perianth is 3-phyllous, but I find it to be 2-phyllous, each piece being in some cases cleft nearly to its base. The ternary variation in the perianth, even did it occur, would not be important; and I cannot regard as of much value the part of Trecul's character taken from this. And the part of his character which is derived from the stipules is founded on a mistake; for, as a matter of fact, the leaf of every one of the fifteen Indo-Malayan species described by him has two stipules at the point of its junction with the stem, at the same level, and therefore "opposite." As the stipules vary much in size, so does their attachment cover a larger or smaller part of the stem. The large stipules encircle the stem, leaving, when they fall, bold annular cicatrices. The smaller stipules have but a small line of attachment; their cicatrices are correspondingly small, and of course do not meet to form a ring. Sometimes the attachment of one of a pair of stipules extends partly into the axil of its leaf, and it thus becomes "*intra-petiolar*," while the twin stipule originates from the stem, either in the normal lateral situation or a little further from the leaf than usual. But in all the principle of attachment is the same. Moreover, even were Trecul's stipular character based on fact, it is a difficult one to work in the Herbarium; for the stipules of the genus are so deciduous that they are rarely found in dried specimens. I propose therefore to abandon Trecul's division into *Jaca* and *Pseudo-Jaca*, and to arrange the species of British India into two groups, according as the apices of the anthocarps on the female inflorescence are free at the apex, or are completely united. The former arrangement gives a spiny or tuberculate, and the latter a smooth, syncarpium.

I ought to explain that, by British India, I understand the Peninsula of Hindustan, Ceylon, Burmah and the Malayan Peninsula; with the islands of Penang and Singapore, and the Nicobar and Andaman groups.

Group I.—Anthocarps partially united, the apices being free, so that the surface of the receptacle bearing the ♀ flowers is spiny or tuberculate.

SECTION I.—The free apices of the anthocarps long and spiny.

- ♀ receptacle sub-globular, lobed . . . . 1. *A. Forbesii.*
- ♀ receptacle globular.
  - With persistent bracts at its base . . . 2. *A. bracteata.*
  - Without persistent bracts at its base.
    - Leaves broadly ovate, minutely and softly tomentose beneath . . . . 3 *A. calophylla.*
    - Leaves obovate-elliptic, oblong, narrowed to the base, sub-hispid, not tomentose . . . . 4. *A. rigida.*
- ♀ receptacle oblong.
  - Spines of ♀ receptacle conical, reflexed, hispid; ♂ receptacle deeply grooved. . 5. *A. Kunstleri.*
  - Spines of ♀ receptacle straight, cylindric; ♂ receptacle long, thin, cylindric, not grooved . . . . 6. *A. hirsuta.*

SECTION II.—Free apices of the anthocarps short, tubercular, *i.e.*, with flat, rarely sharp, points.

- ♀ receptacle oblong.
  - Leaves glabrous or nearly so.
    - Adult leaves glabrous, ovate to ovate-elliptic; ♀ receptacle cylindric, with short, sharp tubercles . . . . . 7. *A. pedunculari**s.*
    - Adult leaves nearly glabrous, oblong-lanceolate; ♀ receptacle cylindric, with broad, rather blunt, tubercles . . . 8. *A. Lowii.*
  - Leaves more or less hairy.
    - Leaves ovate-oblong or obovate-elliptic, cuspidate, coarsely and sparsely hispid, stipules rather large; ♀ receptacle with short, rather sharp, tubercles . . · 9. *A. Polyphema.*
    - Leaves obovate-elliptic, blunt, minutely pubescent, stipules rather large; ♀ receptacle clavate, with broad, flat tubercles . . . . 10. *A. Maingayi.*
    - Leaves ovate-elliptic, softy pubescent beneath, stipules very large; ♀ receptacle with flat, asperulous tubercles . . . . 11. *A. Sortechinii.*
    - Leaves broadly ovate, acuminate, crenate, stipules very large; ♀ receptacle oblong, with transverse constrictions, tubercles flat . . . . 12. *A. nobilis.*

♀ receptacle globular.

  Leaves ovate-lanceolate, oblong, entire, smooth . . . . 13. *A. lanceæfolia.*
  Leaves obovate, sub-rotund, or oblong and deeply lobed, scabrid-pubescent . . . 14. *A. Chaplasha.*

Group II.—Anthocarps completely united, even to their apices, so that the surface of the female receptacles is smooth, not tuberculate or spiny.

♂ receptacles cylindric . . . . 15. *A. Denisoniana.*

♂ receptacles globose.

  Leaves oblong to sub-obovate, rounded at the base, pubescent beneath; ♀ receptacles globose or depressed globose, irregularly lobed, 2 to 3 inches in diameter . . . . 16. *A. Lakoocha.*
  Leaves oblong to ovate-elliptic or oblong-elliptic, cuspidate, shining; ♀ receptacle globose or ovoid, smooth and shining, ·75 inch to 1·25 inch in diameter . . . . 17. *A. Gomeziana.*

Group I.—Anthocarps partially united, the apices being free, so that the surface of the receptacle bearing the ♀ flowers is spiny or tuberculate.

Section I.—The free apices of the anthocarps long and spiny.

1. Artocarpus forbesii, *nov. spec.* Foliis oblongis, ellipticis vel sub-obovato ellipticis, glabris, nitidis; receptaculis feminiis sub-glabris, irregulariter 2—3 lobatis; spinis conicis, nitidis.

Mengkoelem, in Western Sumatra, at an elevation of 1,500 ft.,—*H. O. Forbes* (*Herb.* 3080); Perak (*King's Collector*, 10829)

Arbor glabra, 40 usque ad 60 pedalis; ramulis junioribus glabris, cortice valde cicatricosa; folia petiolata, coriacea, oblonga vel sub-obovato-elliptica vel elliptica, apice brevissime cuspidata vel obtusiuscula, basi attenuata, nitida; costulis 5—6-jugis, oppositis, cum nervo medio in superficie inferiore prominulis; 3·5—5·5 unc. longa, 1·5—2·25 unc. lata; petiolis ·75—1 unc.; stipulis . Receptacula feminea ad apicem ramulorum, axillaria, pedunculata, lignosa, *sub-globosa, irregulariter* 2—3 *lobata*; adulta 4 unc. nonnunquam usque ad 8 unc. in diametro, valde echinata, spinis (i.e apicibus anthocarpum singulorum) cylindrato-conicis, patulis, validis, curvatis, glabris, apice perforatis, usque ad ·5 unc. longis. Receptacula ♂ ignota.

Plate 1A.—*Artocarpus Forbesii*, King. Twig bearing an immature female receptacle: *of natural size.*

2. Artocarpus bracteata, *nov. spec.* Foliis obovatis vel elliptico-obovatis, subtus molliter vel hispidato-puberulis, supra puberulis vel sub-glabris; receptaculis feminiis basi bracteatis; spinis rectis, tenuibus, teretibus, lævigatis.—*A. rufescens*, Kurz (not of Miq.), Fl. Brit. Burm. ii. 431.

Malacca,—*Griffith*, (*Kew Distrib.*) 4663; Malacca,—*Maingay*, (*Kew Distrib.*) 1476.

Arbor: ramulis junioribus digiti minime crassitie, adpresse fulvo-pubescentibus, annulatis, cicatricosis; folia coriacea, petiolata, obovata vel elliptico-obovata, apice rotundata, basi attenuata, obtusa vel sub-acuta ; costulis 10 jugis, prominulis; supra puberula vel sub-glabra, subtus minute molliter vel hispidato-puberula, reticulata ; 6—8 unc. longa, 3·5—5 unc. lata, petiolis 1 unc., puberulis; stipulis ovato-acutis, adpresse-sericiis, petiolis brevioribus. Receptacula feminea axillaria, pedunculata, basi 3—4 bracteata, globosa, echinata, spinis (i.e. apicibus anthocarpum singulorum) tenuibus, teretibus, acutis, lævigatis, apice perforatis: receptaculum ♂ ignotum.

This is apparently not a common plant, as it does not occur in the collections of either Father Scortechini or of Mr. Kunstler (the Calcutta Collector). It is at once distinguished by the bracts at the base of the female receptacle. The female receptacles of this resemble those of *A. rigida*, Bl., but the leaves and young branches are very different. Male receptacles of this are unknown. This was considered by Kurz to be Miquel's species *rufescens*, but it does not agree with Miquel's description: moreover Miquel ultimately (*Ann. Mus. Lugd. Bat.* iii. 211.) himself reduced his *rufescens* to *Tampang*, and *Tampang* is in my opinion but a variety of *Lakoocha*, Roxb.

PLATE 1B.—*Artocarpus bracteata*, King. Twig with immature female receptacle: *of natural size.*

3. ARTOCARPUS CALOPHYLLA, *Kurz For. Flora Brit. Burm.* ii. 431. Foliis late ovatis vel ovato-ellipticis, basi rotundis vel sub-cordatis nec attenuatis, subtus molliter tomentosis vel pubescentibus: receptaculis femineis basi ebracteatis, globosis, echinatis; spinis rectis, cylindratis, hispido-scabridis.

Burmah, in Tenasserim,—*Falconer* (1015); *Kurz.*

Young shoots of the thickness of a swan's quill, deeply striate, rugose, and densely covered with short, rufous, tomentum ; leaves coriaceous, petiolate, broadly ovate to ovate-elliptic, entire, acute, the base rounded or slightly cordate; lower surface softly and minutely tawny-tomentose; the midrib and main nerves (of which there are 9 to 11 pairs) stout; minor nerves obscure; upper surface harsh, minutely tuberculate-hispid; the midrib and nerves tomentose; length of blade 4·5 to 6 in., breadth 3 to 4 in. ; petiole ·75 in. or less, tomentose ; stipules in pairs, ovate-lanceolate, tomentose externally, ·75 in. long ; male receptacle unknown; female receptacle globular, on a short peduncle, echinate, sub-hispid ; free apices of anthocarps (spines) about ·25 in. long, scabrid-hispid ; the perforation for the style rather wide ; seeds ovoid, ·5 in. long ; core woody.

I have seen only two specimens of this; Falconer's consisting only of a leafy twig, and Kurz's with a single detached female receptacle. This receptacle is like that of *echinata*, the leaves however being different. The species is a good one if the leaves and receptacle belong to the same tree. Kurz describes it as "an evergreen middle-sized tree."

PLATE 2.—*Artocarpus calophylla*, Kurz. Leafy twig, and detached immature female receptacle: *of natural size. Drawn from Kurz's original specimen.*

4. ARTOCARPUS RIGIDA, *Bl. Bijdr.* 482. Foliis obovato-ellipticis ad oblongis, basi attenuatis, supra (nervis exceptis) glabris vel minute adpresso sub-hispidatis, subtus hispidatis, adultis sub-glabris, nervis adpresso-pubescentibus ; reticulis parvis, distinctis. Receptaculis feminiis globosis; spinis rectis, cylindratis, angulatis, scabridis.—*Trecul in Ann. Sc. Nat. ser.* 3. viii. 114; *Miq. Fl. Ind. Bat.* i. *pt.* 2. 286 ; *Supp.* 418; *in Ann. Mus. Lugd. Bat.* iii. 211; *Kurz For. Flora Brit. Burm.* ii. 431.—*A. echinata*, *Roxb. Fl. Ind.* iii. 527; *Trecul l.c.* 113; *Miq. Fl. Ind. Bat.* i. *pt.* 2. 286; *Supp.* 418; *Wight Icon.* 680.

In the Malayan Archipelago, widely distributed. Sumatra,—*Forbes*, 3041; Perak (*King's Collector*, 6727, 6751, 6921, 7612, 7755),—*Scortechini*, 1979; Malacca,—*Maingay*, 1474; Burmah,—*Helfer*, 4669. From the sea level to elevations of 1,000 ft.

A tree, 50 to 80 ft. in height. Young shoots about as thick as a goose-quill and covered with stiff, sub-adpressed, yellowish, hairs; leaves coriaceous, more or less hard and harsh, obovate-elliptic to oblong, entire; the apex rounded and obtuse or sub-acute; narrowed to the base, which is rounded or acute at its junction with the petiole; upper surface of adult leaves shining, harsh, smooth, except the pubescent midrib and nerves, or sparsely and minutely adpressed sub-hispid; midrib and 10 or 12 pairs of main nerves bold and adpressed-pubescent on the lower surface, the rest of the lower surface sub-glabrous or adpressed-hispidulous; the reticulations minute, distinct; length of blade 4 to 7 in., breadth 2·5 to 3·5 in.; petiole 1 in. long; stipules in pairs, lanceolate, and, like the petiole, adpressed-hispid externally, ·25 in. to ·5 in. long, caducous. Receptacles of both sexes axillary, globular, on short, adpressed-hispid or hispid-tomentose peduncles; the male about 1 in. in diameter; flowers hardly ·1 in. long; the perianth of two sub-concave, ovate, blunt, hirsute pieces; anther small, rounded, exserted; filament rather broad; receptacular scales with flat ciliate tops and stout pedicels: female receptacles echinate, not lobed, about 3 in. in diameter when mature; the free apices of the anthocarps cylindric-conic, straight, about ·25 in. long, hispid-echinate, the apex perforated for the filiform style; seeds oval, about ·5 in. long; core woody.

After carefully comparing authentic specimens of Blume's *rigida* with Roxburgh's published description of *echinata* and with his manuscript drawing of that species in the Calcutta Herbarium, I am convinced that the two are the same. Roxburgh's must therefore give way to the older name of Blume. Specimens vary considerably as to hairiness, less so as to form of leaf. Some have the under surface of the leaves, the petioles and peduncles, densely tomentose-hispid, while others are nearly glabrous. Some of the Perak specimens have the leaves obovate, while the leaves of Forbes's and Scortechini's specimens (*Herb. Scort.* 1979) have acute apices. The specimens issued by Wallich (*Cat.* 4658) as *echinata*, Roxb. consist partly of *Artocarpus Gomeziana*, Wall., and of leaves of *Ficus callosa*, Willd., with loose receptacles of *Artocarpus echinata*, Roxb.

Plate 3.—*Artocarpus rigida*, Bl. Branch with immature female receptacle. 1, transverse section of mature female receptacle; 2, young female receptacle—*of natural size;* 3, 4, 5, male flowers from different specimens; 6, male flower opened up, side view; 7, 8, receptacular scales; 9, free apex of an anthocarp with style and stigma protruding: *enlarged.*

5. Artocarpus kunstleri, *nov. spec.* Foliis permagnis, ovato-ellipticis, ad apicem basemque attenuatis, adultis integris, juvenilibus grosse serratis. Receptaculis fem*i*niis oblongis, echinatis; spinis reflexis, hispido-tomentosis; stipulis 4—7 unc. longis, externe sericiis.

Perak, in the low country (*King's Collector*, 3494, 6799, 6967, 10965); Malacca,—*Maingay*, (*Kew Distrib.*) 1484.

Arbor, 40—60 pedalis; ramulis junioribus circa ·75 unc. diametro, fulvo-tomentosis, annulatis; folia petiolata, coriacea, ovato-elliptica, ad apicem basemque attenuata, subtus æquabiliter adpresso-pilosa, costulis 10—12 jugis, cum nervo medio prominulis, venis sub-transveris; supra subtiliter adpresso-hispidis, nervo medio costulisque tomentosis; 9 unc. usque ad 2—3 pedes longa, 6—15 unc. lata; petiolis 1·5—3 unc. longis; stipulis geminis, magnis, gemmas tegentibus, ovato-lanceolatis, extus dense fulvo-tomentosis intus glabris, 4—7 unc. longis. Receptacula utriusque sexus axillaria pedunculata; pedunculis 2—3 unc. longis; receptaculis ♂ cylindratis, vermiculato-rugosis, 4—5 unc. longis, 1—1·5 unc. latis, pubescentibus: fl. ♂ sessilibus, perianthii squamis duobus ovatis, concavis, extus hispido-pubescentibus, intus glabris; stamen 1; filamento apice incrassato; antheris loculis sub-glabris, basi divergentibus, longitudinaliter dehiscentibus. Receptacula feminea 4—7 unc. longa, 2·5 unc. in diametro; spinis cylindratis, hispidulo-tomentosis, valde reflexis; paleis nullis.

This is a superb tree; the male receptacles are cream-coloured, the female yellow. The latter often split at the apex when dry. When immature the core is woody.

Plate 4.—*Artocarpus Kunstleri*, King. Twig with small young leaves and ♂ receptacle. 1, detached immature ♂ receptacle—*of natural size;* 2, outer surface of one of the two pieces of the ♂ perianth; 3, inner surface of the same; 4, anther: *enlarged.*

6. Artocarpus hirsuta, *Lamk. Encycl.* iii. 210. Foliis late ovatis vel ovato-ellipticis, raro obovatis, ad basem paulum attenuatis, apice sub-acutis. Receptaculis feminiis ovoidiis,

echinatis; spinis rectis, cylindratis, valde hispidulis.—*Roxb. Fl. Ind.* iii. 527; *Wight Ic.* 1957; *Dalz. Fl. Bomb.* 244.—*Artocarpus pubescens*, Willd. Sp. Plant. iv. 189; Trecul in Ann. Sc. Nat. Ser. 3. viii. 122; Wall. Cat. 4656.—*Ansjeli*, Rheede Hort. Malab. iii. t. 32.

Malabar, Concan,—*Gibson, Stocks, Law, Wight* (2715).

Young shoots as thick as a goose-quill, adpressed hispid, as are the peduncles, stipules, petioles, midribs, and main nerves underneath; otherwise glabrous; leaves shortly petiolate, coriaceous, entire, smooth when adult, broadly ovate to ovate-elliptic, rarely obovate, slightly narrowed to the base, the apex sub-acute, main nerves and midrib strong, prominent on the under surface; length of blade 6 to 9 in.; breadth 4 to 6 in.; petiole under 1 in.; stipules lanceolate, nearly 1 in. long. Receptacles axillary, pedunculate; the males pendulous, the females erect; males narrowly cylindric, from 4 to 6 in. long and only about ·25 in. in diameter; male flowers minute, the perianth of two pieces, united into a tube below; anther exserted, ovate, the cells not divergent; receptacular scales chaffy, not peltate; female receptacle ovoid, about 4·5 in. long and 3·5 in. in diameter, echinate; the spines (free apices of anthocarps) about ·25 in. long, cylindric, straight, strongly hispid, perforate at the apex for the filiform style; seeds ovoid, ·65 in. long; core woody.

Plate 5.—*Artocarpus hirsuta*, Lamk. Branch with one immature female and three mature male receptacles. 1, mature female receptacle, 5, seeds—*of natural size*; 2, male flower; 3, receptacular scales; 4, female flower: *enlarged*.

Section II.—Free apices of the anthocarps short, tubercular; i.e. with flat, rarely with sharp, points.

7. Artocarpus peduncularis, *Kurz in Trim. Journ. Bot.* for 1875, p. 303. Foliis glabris, ovatis ad ovato-ellipticis, basi rotundatis; stipulis majusculis; receptaculis ♂ et ♀ erectis, receptaculis ♀ cylindratis, sub-acute tuberculatis.

Nicobar Islands,—*Kurz;* Perak, at the base of Ulu Bubong, (*King's Collector*) 9530.

A tree, from 40 to 50 ft. high; young branches about the thickness of a goose-quill, narrowly annular, puberulous, all other parts glabrous except the stipules; leaves coriaceous, petiolate, ovate or ovate-elliptic, entire, blunt; the base rounded, sub-emarginate; both surfaces smooth; the 6 or 7 pairs of lateral nerves, midrib, and reticulations prominent on the lower surface; length of blade 5 to 7 in., breadth 3 to 4 in.; petiole 1·5 in. to 2 in. long; stipules, in pairs, linear-lanceolate, adpressed-pubescent externally, 1·5 in. to 2 in. long, caducous. Receptacles of both sexes erect, axillary, cylindric, on peduncles 2·5 to 3·5 in. long; male receptacles 1·25 in. long and ·2 in. in diameter; flowers not mixed with receptacular scales; the perianth of two oblong, blunt, entire pieces, pilose externally; filament thickened above; the anther slightly exserted, its connective wide, apiculate, the loculi divergent; female receptacles (immature) 2 to 2·5 in. long and about 1 in. in diameter, sometimes shortly and irregularly lobed, tuberculate, smooth; the tubercles (apices of the anthocarps) stoutly 4- or 5-angled, slightly conical; seeds few, about ·5 in. long; core woody; mature receptacles unknown.

Plate 6.—*Artocarpus peduncularis*, Kurz. Branch with male and female receptacles (the latter immature). 1, stipules—*of natural size*; 2, the two pieces of the male perianth, seen from front and back; 3, anther, seen from behind; 4, the same, seen from the front: *enlarged*.

8. Artocarpus Lowii, *nov. spec.* Foliis adultis puberulis vel sub-glabris, oblongo-lanceolatis, subtus minute reticulatis; stipulis majusculis; receptaculis feminiis oblongis, cylindratis, breviter et sub-obtuse tuberculatis, minute rugosis nec echinatis.

Perak, (*King's Collector*) 7737.

Arbor vasta, 50 usque ad 70 ped. alta; ramulis junioribus cygni pennæ crassitie, cum petiolis pedunculisque parce pubescentibus; folia subglabra, petiolata, tenuiter coriacea, oblongo-elliptica, integerrima, apice acuta, basi sub-attenuata, subtus minute reticulata, costulis 10—11-jugis, prominentibus, nervo medio valde prominente; supra glabra, sub-nitida; 9—11 unc. longa, 3·5—5 unc. lata; petiolis 1·25 unc. longis; stipulis geminis, oppositis, anguste lanceolatis, extus puberulis, intus glabris, 2·5—3 unc. longis, valde deciduis. Receptacula utriusque sexus axillaria, cylindrata, pedunculata; mascula in axillis supremis, ·5—·75 unc. longa, ·25 unc. in diametro; squamulæ floris masculi 2, ovatæ, apice incrassatæ, truncatæ, extus hirsutæ, intus glabræ; stamen inclusum, anthere ovato; squamæ receptaculi ligulatæ, nec peltatæ, hirsutæ; receptacula feminea oblonga, cylindrata, masculis multo majora, breviter tuberculata, glabra; apicibus anthocarpum singulorum conicis, 4—5 angulatis, minute rugosis, nec echinatis.

This was only once collected by Mr. Kunstler. He describes the mature receptacles as 2 or 3 in. long. The specimens collected by him, which are evidently young, measure about 1·5 in. in length and ·75 in. in diameter, and, as the seeds they contain are quite immature, I think it probable that the mature receptacle will, when collected, be found to measure considerably more than Mr. Kunstler states.

PLATE 7A.—*Artocarpus Lowii*, King. Twig with ♂ and ♀ receptacles—*of natural size*; 1 & 2, the two pieces of the male perianth seen from behind and in front; 3, stamen; 4, receptacular scale: *enlarged*.

9. ARTOCARPUS POLYPHEMA, *Pers. Ench.* ii. 531. Novellis strigosis; foliis ovato-oblongis vel sub-obovato ellipticis, cuspidatis, subtus plus minus strigosis; stipulis majusculis; receptaculis feminiis oblongis, cylindratis, breviter et acute tuberculatis.—*Bl. Bijdr.* ii. 481; *Trecul in Ann. Sc. Nat. ser.* 3. viii. 115; *Miq. Fl. Ind. Bat.* i. *pt.* 2. 286; *in Ann. Mus. Lugd. Bat.* iii. 211; *Wall. Cat.* 4659.—*Polyphema Champeden*, Lour. Fl. Cochin-China, ii. 347.

In the Malayan Archipelago and Cochin-China; Penang, *Wallich. Cat.* 4659; *King's Collector*, 1636. W. Java,—*Forbes*, 303.

Young shoots thin, dark-coloured, hispidulous, as are the stipules, petioles, peduncles, and lower surfaces of the midribs and nerves; leaves ovate-oblong to sub-obovate elliptic, entire; the apex suddenly and shortly cuspidate; the base narrowed; lower surface smooth, shining, the nerves (5 to 9 pairs) and midrib strigose; upper surface smooth, dull, the midrib and nerves pubescent; length of blade 3·5 to 8 in., breadth 1·5 to 2·5 in.; petioles ·5 in.; stipules 1 to 1·5 in. long, lanceolate, convolute. Receptacles of both sexes axillary, erect, cylindric, pedunculate; male receptacles equalling their slender peduncles, 1 in. to 1·75 in. long, ·3 to ·4 in. in diameter; flowers with perianth of 2 thick, oblong, entire, truncate, pubescent pieces; the anthers broadly cordate, exserted; receptacular scales absent; female receptacles oblong, cylindric, not lobed, 2 in. long and nearly 1 in. broad; the free apices of the anthocarps 4- or 5-angled, truncate, puberulous, about ·1 in. long.

In Penang this occurs as a small tree 20 to 25 ft. in height. The young leaves are densely covered with yellowish, tawny bristles, many of which are deciduous. In young plants, 3-lobed leaves are not uncommon.

PLATE 7B.—*Artocarpus Polyphema*, Pers. Branch with male receptacles. 1, detached female receptacle, immature; 2, stipules—*of natural size*; 3, male flower dissected, showing the inner and outer sides of the two pieces of the perianth and the stamen: *enlarged*.

10. ARTOCARPUS MAINGAYII, *nov. spec.* Foliis obovato-ellipticis, obtusis, subtiliter pubescentibus; stipulis parvis; receptaculis feminiis obovato-cylindratis, tesselato-tuberculatis, puberulis; tuberculis latis, truncatis, annulato-pertusis.

Malacca,—*Maingay*, (*Kew Distrib.*) 1481; Perak,—*Scortechini*; (*King's Collector*) 3595, 6963.

Arbor mediocra, 20 usque ad 40 ped. alta; ramulis junioribus tenuibus, longitudinaliter striatis, plus minus annulatis, asperulo pubescentibus; folia rigide coriacea, petiolata, obovata, ad basem attenuata, apice rotundato-obtusa, integerrima, supra asperula, sub-hispidula, subtus adpresse-pubescentia, reticulata; costulis 8—9 jugis, sub-prominentibus; 2·5—4 unc. longa, 1·5—2 unc. lata; petiolis gracilibus, pubescentibus ·5 unc. longis; stipulis geminato-oppositis, lanceolatis, extus adpresse-sericiis, intus glabris, ·5 unc. longis. Receptacula utriusque sexus axillaria, pedunculata; mascula cylindrata, vermiformia, valde rugulosa, 1·5—2 unc. longa, 25 unc. lata; pedunculis pubescentibus, ·5 unc. longis; squamæ receptaculariæ nullæ; fl. ♂ sepala 2, plana, quadrata; anthere exserto, late ovato; receptacula feminea obovato-cylindrata, tesselato-tuberculata, puberula; singulorum anthocarpum apicibus liberis brevissimis, planis, foramine minute pertusis, asperulis.

This agrees in many respects with Miquel's description (*Fl. Ind. Bat. Supp.* 420) of his species *A. Dadah*, and it much resembles a leaf specimen so named in the Calcutta Herbarium, but the nerves of the leaves join the midrib at a different angle. Miquel, moreover, describes the leaves of his *Dadah* as ‘*e basi rotundatis*;” whereas, in this, the leaves are markedly attenuate at the base. It also appears to approach the species which Miquel named *Teysmanni*.

PLATE 8A.—*Artocarpus Maingayii*, King. Twig with ♂ and ♀ receptacles—*of natural size.* 1 & 2, male flowers: *enlarged.*

11. ARTOCARPUS SCORTECHINII, *nov. spec.* Foliis ovato-ellipticis, sub-obtusis, subtus molliter pubescentibus; stipulis magnis; receptaculis feminiis cylindratis, tuberculatis, asperulis; tuberculis truncatis.

Perak, on low ground (*King's Collector*, 7792),—*Scortechini* (without number).

Arbor vasta, 60—80 ped. alta; ramulis junioribus digiti minimi crassitie, annulatis, verrucello-tuberculatis, parce puberulis; folia rigide coriacea, petiolata, ovato-elliptica, integerrima, apice sub-obtusa, ad basem sub-attenuata; supra, praecipue præter nervos, minute puberula; subtus molliter et subtiliter pubescentia, costulis 14—16 jugis cum nervo medio prominentibus et adpressse pubescentibus; 8—16 unc. longa, 4—5 unc. lata; petiolis puberulis, 1·5 unc. longis; stipulis magnis, geminis, oppositis, ovato-lanceolatis, marginibus recurvis, extus adpresse-sericiis, intus glabris, 2–3 unc. longis; receptacula feminia axillaria, longe pedunculata, (pedunculis lenticello-puberulis), cylindrata, tuberculata, asperula; tuberculis (apicibus liberis florum fertilium) brevibus, 4—5 angulatis, truncatis, foramine minuto pertusis, asperulis nec echinatis; receptacula mascula ignota.

The male receptacles of this are unknown. In foliage it resembles *A. Kunstleri*, but differs in its non-echinate female receptacle and in its much smaller leaves and stipules. I have seen no mature female receptacles. Those in my specimens are apparently a good way from maturity: they measure 2·5 in. in length by 1·25 in. in diameter.

PLATE 9.—*Artocarpus Scortechinii*, King. Branch with immature female receptacles: *of natural size.*

12. ARTOCARPUS NOBILIS, *Thwaites Enum. Pl. Zeylan.* 262. Foliis late ovatis, abrupte acuminatis, grosse crenatis; stipulis permagnis; receptaculis feminiis oblongis, transverse constrictis, tuberculatis; tuberculis latis, truncatis.—*Bedd. Fl. Sylv.* t. 309.—*Artocarpus pubescens*, Moon's Cat. Pl. Ceylon (not of Willd.).

Ceylon, up to an elevation of 2,000 ft,—*Thwaites* (*C. P.* 2818).

Young branches as thick as the little finger, rugulose, hispid-scabrid, as are also the stipules (externally), the peduncles, petioles, midribs, and nerves; leaves large, coriaceous, more or less sub-scabrid or asperulous on both surfaces, broadly ovate, coarsely crenate, shortly acuminate, the base narrowed or rounded; lateral primary nerves about 9 pairs, rather prominent; length of blade 6 to 14 in., breadth 4 to 10 in.; petiole stout, ·75 to 1·5 in. long; stipules in pairs, spathiform, 3 to 5 in. long. Receptacles of both sexes oblong, axillary, on stout peduncles: the males 3 to 6 in. long, ·5 in. to ·65 in. in diameter; the peduncles about 3 in. long; flowers with perianth of two broad ovate-truncate, nearly smooth, pieces; the anther broad, 2-celled, exserted: female receptacle oblong, cylindric, 6 to 8 in. long by 2·5 to 4 in. in diameter, tuberculate; the free apices of the anthocarps short, 4- or 5-angled, rather flat; seeds sub-globular, about ·5 in. in diameter; core woody. Receptacular scales on both kinds of receptacles, flat, hairy, on hour-glass-shaped pedicels.

A fine tree, from 40 to 50 ft. high. For a long time confounded with the Malabar species *hirsuta*, Lamk., from which it differs in the larger and crenate leaves and differently shaped female receptacles. The male receptacles of this are, moreover, on stout erect peduncles, whereas those of *hirsuta* are drooping.

PLATE 10.—*Artocarpus nobilis*, Thw. 1, detached leaf; 2, apex of a branch with stipules, two ♂ receptacles and one young ♀ receptacle; 3, small mature ♀ receptacle—*of natural size;* 4, male flower; 5, receptacular scale : *enlarged. The figure of the mature ♀ receptacle is copied from Thwaites's original drawing, kindly lent to me by his successor at Peradeniya, my friend Dr. H. Trimen.*

13. ARTOCARPUS LANCEÆFOLIA, *Roxb. Fl. Ind.* iii. 527. Foliis ovato-lanceolatis vel elliptico-oblongis, integerrimis, breviter et obtuse cuspidatis; stipulis parvis; receptaculis feminiis globosis, tuberculatis, pubescentibus; tuberculis truncatis.—*Wight Icon.* 679; *Trecul in Ann. Sc. Nat. ser.* 3. viii. 122; *Miq. Fl. Ind. Bat.* i. *pt.* 2. 289.

Malacca,—*Maingay*, (*Kew Distrib.*) 1478; Perak, at the bases of the hill ranges and up to 800 ft. (*King's Collector*, 3452, 3826, 7631).

Glabrous in all its parts except the receptacles and stipules; young shoots rather stout, dark-coloured, annular; leaves entire, coriaceous, ovate-lanceolate; the apex shortly and bluntly cuspidate; the base narrowed; lateral nerves 8 to 10 pairs, rather prominent on both surfaces when dry; reticulatious obscure; length of blade 9 to 14 inches, breadth 4·5 in. to 7 in.; stipules in pairs, ovate-lanceolate, adpressed, fulvous-pilose, ·5 in. to ·75 in. long. Receptacles of both sexes axillary, on peduncles from 2 to 3 in. long; male receptacles obovate-cylindric, from ·75 in. to 1 in. long and ·5 to ·6 in. in diameter; the male flowers sessile; the perianth of two linear elliptic scales, slightly united by their bases, their apices entire or bifid, filament slender, as long as the perianth, exserted for half its length; anther ovate-elliptic, its cells parallel; receptacular scales numerous, sub-infundibuliform, the margin entire or sub 3-lobed, ciliate, the pedicel filiform; female receptacles globular, tuberculate, pubescent, about 3 in. in diameter when mature; the free apices of the anthocarps short, blunt, sub-quadrate, perforated by the filiform style; seeds few, ovoid, ·6 in. long; core woody; receptacular scales like those in the male receptacle, but smaller and fewer in number.

A superb tree, from 60 to 80 ft. in height. Roxburgh's original description of this species occupies only two lines, and were it not for his manuscript drawing in the Calcutta Herbarium (copied by Wight as his *Icon.* 679) it would be impossible to identify Roxburgh's plant. The drawing, however, puts the identification beyond doubt. This species was not issued by Wallich.

PLATE 11.—*Artocarpus lanceæfolia*, Roxb. Branch with male receptacles. 1, mature female receptacle; 2, transverse section of the same—*of natural size;* 3, male flower; 4, male perianth with bifid apex; 5, male perianth with entire apex; 6, receptacular scales from male receptacle; 7, the same from female receptacle; 8, barren anthocarps : *enlarged.*

14. ARTOCARPUS CHAPLASHA, *Roxb. Fl. Ind.* iii. 525. Foliis scabrido-pubescentibus, obovatis, sub-rotundis vel oblongis, integerrimis, serrato-dentatis vel irregulariter lobatis; stipulis majusculis; receptaculis feminiis globosis, tuberculatis, pubescentibus; tuberculis truncatis.—*Trec. in Ann. Sc. Nat. ser.* 3. viii. 112; *Wight Icon.* 682; *Kurz For. Flora Brit. Burm.* ii. 432; *Wall. Cat.* 4657.

Tropical forests in Eastern Bengal, Assam, Chittagong, Burmah, and the Andamans.

A tree, often 100 to 150 ft. high; the young shoots with dark, rough, fibrous-tomentose bark; leaves shortly petiolate, thinly coriaceous, minutely dentate-serrate or entire, obovate or sub-rotund, gradually and slightly narrowed to the blunt or sub-cordate base; the apex broad, rounded, occasionally slightly cuspidate (leaves of young shoots often pinnatifidly lobed); both surfaces harsh, subscabrid, the upper minutely and sparsely hispid, the midrib and larger nerves tomentose; under surface, with the 8 to 10 pairs of primary nerves and the midrib and reticulations distinct and more or less adpressed-pilose or hispid; length of blade 7 to 12 in., breadth 4 to 8 in. (lobed leaves of young shoots often 1 to 2 ft. long); petioles short, stout, hispid-tomentose, ·5 in. long or less; stipules in opposite pairs, spathiform, adpressed-hispid externally, smooth within, 1·5 in. long; receptacles of both sexes axillary, globular, on long peduncles, the males about the size of a nutmeg, puberulous; male flowers mixed with receptacular scales, sessile; the perianth of two narrowly-oblong, pubescent pieces, bifid at the apex; filament thin, as long as the perianth; anther cells 2, exserted, ovoid-globose; receptacular scales numerous, infundibuliform, hairy above, on slender pedicels; female receptacles globular, not lobed, tuberculate, pubescent, 3 or 4 in. in diameter; apices of the anthocarps free, quadrate, truncate, pubescent; seeds few, ovoid, flattened, ·75 in. long.

PLATE 12.—*Artocarpus Chaplasha*, Roxb. Part of a leaf-twig. 1, male receptacle; 2, female receptacle; 3, section of the same—*of natural size*; 4, male flower; 5, the two pieces of the male perianth, seen from outside and inside; 6, receptacular scale; 7, apex of an anthocarp: *enlarged.*

Group II.—Individual anthocarps completely united even to their apices, so that the surface of the syncarpium is smooth, not tuberculate or spiny.

15. ARTOCARPUS DENISONIANA, *nov. spec.* Foliis oblongo-ellipticis vel ovato-ellipticis, cuspidatis, basi attenuatis. subtus glaucescentibus vel subpuberulis; stipulis parvis, glabris; receptaculis masculis cylindratis; femiuiis obovoidiis, sub-lævigatis, haud lobatis, ·75 unc. in diametro.

At the base of Ulu Bubong, in Perak (*King's Collector*, 10318, 10843, 10987).

Arbor, 40 usque ad 60 pedalis, sub-glabra; ramulis junioribus gracilibus, fuscis; folia sub-coriacea, petiolata, oblongo-elliptica vel ovato-elliptica, sub-abrupte breviterque acuminata, basi attenuata raro rotundata, supra (nervo medio excepto) glabra, nitida, subtus glaucescentia vel subpuberula, adulta glabra, nervis 7 ad 10 jugis, prominulis; 5—7 unc. longa, 2—3·5 unc. lata; petiolis ·75 unc. ad 1 unc. longis; stipulis parvis, geminis, ovato-lanceolatis, glabris. Receptacula utriusque sexus axillaria, breviter pedunculata; mascula in axillis supremis, cylindrata, ·75 ad 1·5 unc. longa, ·2 unc in diametro; squamulæ perianthii floris masculi 4, oblongæ, apice truncatæ, incurvatæ, incrassatæ, hirsutæ, interdum in tubo coalitæ, filamento incrassato; receptaculi squamæ peltatæ, ciliatæ, pedicillis incrassatis; receptacula feminia obovoidea, rugulosa, (adulta sublævigata), puberula, multis cum squamis peltatis sessilibus induta.

This appears to be rather a local species, as it has been sent only from Ulu Bubong by Mr. Kunstler, the Calcutta Garden Collector, and it does not occur at all in Father Scortechini's collections from other parts of the province. This may possibly be the same as *A. tephrophylla*, Miq., with the author's imperfect description of which it partly agrees. Miquel does not describe the female receptacles; it is difficult therefore to identify his plant. As regards stipules, this differs from *tephrophylla*, the stipules of which are said to be "*aureo-velutinæ.*" I have named the species after Mr. Denison, a member of the British Administration in Perak.

PLATE 8B.—*Artocarpus Denisoniana*, King. Branch with male receptacles. 1, detached female receptacle; 2, vertical section of the same—*of natural size;* 3, male flower with perianth of four separable pieces; 4, male flower with the perianth united into a tube, the tube laid open; 5, peltate pedicellate scales from male receptacle: *all enlarged.*

16. ARTOCARPUS LAKOOCHA, *Roxb. Fl. Ind.* iii. 524. Foliis oblongis, ellipticis vel sub-obovatis, breviter cuspidatis, basi rotundatis rarius attenuatis, subtus molliter pubescentibus; stipulis parvis, lanceolatis, pubescentibus; receptaculis utriusque sexus globosis; feminiis nonnihil leviter lobatis, 2·3 unc. in diametro.—*Trecul in Ann. Sc. Nat. ser.* 3. vii. 117; *Miquel in Fl. Ind. Bat.* i. *pt.* 2. 287; *Ann. Mus. Lugd. Bat.* iii. 213; *Wall. Cat.* 4655.—*A. mollis*, Wall. Cat. 4661; Wight Ic. 681; Dalz. Fl. Bomb. 244; Bedd. Fl. Sylvat. 219; Brandis For. Flora 426; Kurz For. Flora Burm. ii. 433.

India, Ceylon, and Burmah, up to elevations of 2,500 ft.; widely distributed. Often cultivated for its eatable receptacles. Malacca,—*Griffith*, (*Kew Distrib.*) 4666; *Maingay*, 1479.

Young shoots thin, densely and softly fulvous-tomentose; leaves petiolate, thinly coriaceous, oblong, sub-obovate, or elliptic, entire (sometimes serrate when young); the apex rounded, shortly cuspidate or sub-acute; the base slightly attenuate or rounded, or broad and sub-truncate; under surface shortly and softly pubescent; the lateral nerves 8 to 12 pairs, rather prominent, as are the midrib and main nerves; upper surface glabrous and shining, or minutely puberulous; the midrib and larger nerves pubescent; length of blade 4 to 12 inches, breadth 2 to 6 inches; petiole ·5 in. to 1 in. long, pubescent, glabrous when adult; stipules lanceolate, tawny-pubescent, ·5 in. long. Receptacles of both sexes axillary, globular, on short pubescent peduncles: male receptacles from ·5 in. to 1 in. in diameter, puberulous; male flowers short, sessile; the perianth of 2 (sometimes of 3) triangular, truncate, puberulous pieces; filament broad below, tapering upwards to the short, broad, 2-celled, longitudinally-dehiscent, exserted anther; receptacular scales on pedicels which are thickened upwards, flat, entire, puberulous: female receptacle globose, slightly and irregularly lobed, sometimes flattened when old, and from 2 to 3 in. in diameter, the surface glabrous, wrinkled, or smooth; the styles slightly protruding; the anthocarps completely united; ripe seeds few, broad, flat, about ·5 in. across; the core cartilaginous.

VAR. MALAYANA, *King.*—*A. Lakoocha*, Roxb., Miq. in Ann. Mus. Lugd. Bat. iii. 213. Leaves more uniformly elliptic and longer than in the typical form; receptacles or peduncles more than 1 in. long; pieces of male perianth fleshy; female receptacle quite smooth, from 1·25 in. to 1·25 in. in diameter, sometimes slightly lobed.—*A. Tampang*, Miq. Fl. Ind. Bat. Suppl. 421.—*A. rufescens*, Miq. Fl. Ind. Bat. Suppl. 420; Ann. Mus. Lugd. Bat. iii, 211.

Perak and Penang (*King's Collector*, 1640, 4187, 5653); Amboina, de Fretes.

In India this is a tree 20 or 30 ft. high, with spreading umbrageous head. In the Malayan countries it attains a height of 40 to 50 ft. Specimens from Sikkim, and from Kohima in the Naga Hills (C. B. Clarke), have more coriaceous leaves, with bold nervation and unusually large, rather rough, female receptacles.

PLATE 13.—*Artocarpus Lakoocha*, Roxb. Branch with young receptacles. 1, mature female receptacle; 2, section of the same—*of natural size, and copied from Roxburgh's original drawing in the Calcutta Herbarium;* 3, section of a young female receptacle showing two anthocarps with their styles; 4, male flower with 2-leaved perianth; 5, male flower with the pieces of the perianth 2-cleft; 6, receptacular scale; 7, female flower: *enlarged.*

17. ARTOCARPUS GOMEZIANA, *Wall. Cat.* 4660. Foliis oblongis vel ovato-oblongis, breviter cuspidatis, nitidis; receptaculis masculis breviter cylindratis vel globosis; feminiis globosis vel ovoidis, integris, glabris, haud lobatis, ·75 unc. ad 1·25 unc. in diametro.—*Kurz For. Flora Brit. Burm.* ii. 433.—*A. pomiformis*, Teysm. and Binn. Nat. Tijdsch. Ned. Ind. xxv. 400.

Burmah, in Tavoy district (*Wallich Cat.* 4660 and 4658A); Malacca,—*Maingay* (*Kew Distrib.* 1486); Perak (*King's Collector*, 4189, 5078, 7535, and 8838); Andamans (*King's Collector*, 416).

Young branches and receptacles minutely puberulous; otherwise glabrous; leaves shining, sometimes sub-pruinose beneath, thinly coriaceous, petiolate, oblong or ovate-oblong, entire; the apex shortly cuspidate; the base minutely 3-nerved, slightly attenuate or rounded, sometimes broad and sub-truncate; lateral primary nerves 8 (rarely as many as 12) pairs, very prominent beneath, as are the midrib and reticulations; upper surface smooth, shining; length of blade 3·5 in. to 7 (rarely as much as 11) in.; breadth 1·5 in. to about 4 in; stipules small, linear, ·2 in. long, caducous. Receptacles of both sexes axillary, shortly pedunculate, more or less globular, smooth; the males ·2 in. to ·5 in., the females ·75 in. to 1·25 in. in diameter when mature; male flowers intermixed with numerous pedicellate, broadly-peltate, puberulous scales; male perianth of 2, flat, puberulous, ovate, pieces; stamen single; the filament as long as the perianth, its apex dilated; anther with

2 ovate, transversely dehiscent, divergent loculi, exserted; female receptacles globular or ovoid, smooth; the anthocarps completely united, only a few bearing seeds.

VAR. GRIFFITHII, *King.* Leaves oblong or oblong-elliptic, 3·5 to 6 in. long; female receptacle ovoid, ·75 in. in diameter; male receptacle ·2 in. in diameter. Smaller in all its parts than the type form.

Malacca,—*Griffith*, (*Kew Distrib.*) 4665; *Maingay* (1482); Perak,—*Scortechini*, 683; *King's Collector*, 6651, 7533.

A moderately-sized tree; the receptacles quite smooth on the surface, the succulent apices of the anthocarps being completely fused together so as to form a continuous fleshy mass, through small perforations in which the styles (in the young state) can be seen protruding. Only a few of the anthocarps ripen seeds, which are ovoid and about ·5 in. long. In the variety *Griffithii* all the parts are smaller, and the leaves are more shining and never pruinose beneath; the stamens are also slightly different from those of typical *Gomeziana.*

PLATE 14A.—*Artocarpus Gomeziana*, Wall. Branch with immature female receptacle. 1, mature female receptacle; 2, transverse section of the same—*of natural size;* 3, vertical section of young female receptacle, showing the ovaries; 4, section of an older receptacle showing the young seeds; 5, male flower; 6, one of the two pieces of the male perianth; 7, anther; 8, pedicellate peltate scale, from male receptacle; 9, apex of the same seen from above: *all enlarged.*

PLATE 14B. *Artocarpus Gomeziana*, Wall. var. *Griffithii*, King. Branch with male and young female receptacles. 1, mature female receptacle—*of natural size;* 2, section of same showing arrangement of ovaries; 3, male flower opened out; 4, receptacular scale: *enlarged.*

Besides the foregoing, which are indigenous, there are found in India in cultivation the two species *A. integrifolia* and *communis* (the Jack and the Bread-fruit). I do not know what *Art. ? Finlaysoniana* (Wall. Cat. 4662) is.

THE

INDO-MALAYAN SPECIES

OF

QUERCUS AND CASTANOPSIS.

BY

GEORGE KING, M.B., LL.D., F.R.S., F.L.S.,

Superintendent of the Royal Botanic Garden,

CALCUTTA.

HAVING found by experience how difficult it is to distinguish from descriptions alone—however excellent they may be—the species of *Quercus* and *Castanopsis* indigenous to South Eastern Asia, I was led some years ago to examine the type specimens of all the published species, to have a drawing made of each, and in fact to work up the species of both genera critically. Learning from Sir Joseph Hooker, the distinguished editor of the *Flora of British India*, that the publication of the results of my studies might be of some use, I now venture to give them to the botanical public. In treating the species of *Quercus*, I follow the sectional arrangement originated for the most part by M. Alphonse De Candolle, and adopted by the late Mr. Bentham and Sir Joseph Hooker in their invaluable *Genera Plantarum.* The species included in the first and largest of these sections (*Lepidobalanus*) are chiefly American and European, only a small proportion of the 183 described by M. Alphonse De Candolle in the *Prodromus* (vol. xvi. *pt.* 2) being Asiatic. The second section (*Cyclobalanopsis*) was originally formed by Oersted to include the species in which, with the zonate cupules of *Cyclobalanus*, there are associated the pendent male catkins of *Lepidobalanus.* The members of this group are all Asiatic, one at least of them (*Q. glauca*) having a wide distribution from Japan to the North-Western Himalaya, some being confined to Japan or China, the remainder being Indo-Malayan. Of the third group (*Pasania*) only one is American, some are Japanese and Chinese, but the majority are Indo-Malayan.

The species of the fourth section (*Cyclobalanus*) are all Asiatic; but only fourteen of them enter into the Indo-Malayan flora. The fifth and sixth (*Chlamydobalanus* and *Lithocarpus*) are small sections, and the species, being mostly Indo-Malayan, fall to be described in this monograph, in which I attempt to do for the species of *Quercus* and *Castanopsis* which belong to this flora what Michaux and Liebmann did for the oaks of America, and what Kotschy did for those of Europe and the Levant. Many of the species treated of in the following pages have already been excellently described by M. A. De Candolle in the *Prodromus* and by Sir Joseph Hooker in the *Flora of British India;* while some of them have not only been described, but have been admirably figured by Blume, Korthals, and Oudemanns. And it is not with the remotest intention of disparaging the work of these high authorities that I here issue new descriptions and drawings of these species, but simply because I believe it may be useful to working botanists to be provided, in a single volume easy of acquisition, with a complete series of descriptions and figures not only of all the species described in Sir Joseph Hooker's *Flora of British India*, but of those also which have not as yet been collected beyond the limits of Dutch India.

Between the genera *Quercus* and *Castanopsis* the differences appear to me to be not only slight, but rather arbitrary; and I see no good reason why every *Castanopsis* described below should not be put into section *Chlamydobalanus* of the genus *Quercus.* But as genera and species are after all but conveniences for study, it seems undesirable to disturb the arrangement by which a number of species with prickly or tubercular involucres completely enveloping the nuts and splitting irregularly to let them escape are separated off under the generic name *Castanopsis.* The arrangement has the sanction of high authority, and it has been hallowed by time. To upset it would add something to an already too heavy synonymy, and it therefore appears best to let it stand. Except one, which is American, the species of *Castanopsis* are Asiatic, and the majority are Indo-Malayan.

QUERCUS, LINN. Gen. No. 1070.

Monoiceous trees or shrubs with evergreen or deciduous, alternate, penni-nerved leaves. *Flowers* small or minute, bracteolate; the males in pendulous or erect spikes or panicles; the females in erect, unisexual or androgynous spikes. *Male flower;* perianth with 4—7 segments (usually with 6); stamens 6 to 12, filaments slender, anther-cells parallel, dehiscing suturally; pistillode hairy or 0.—*Female flower* enclosed in an involucre of imbricate scales, the perianth urceolate, the tube adherent to the ovary, the limb minute-lobed, staminodes small or absent; ovary inferior, after fecundation more or less completely 3-celled (rarely 4- or 5-celled), the cells 2-ovulate; styles 3-5, short. *Ripe nut* or glans ovoid, globose or turbinate, 1-celled, surrounded by the accrescent cupuliform involucre which embraces more or less of its lower half, or the whole of it; the involucral scales hardened into teeth or spines or coalesced into zones. Nut attached to the woody involucre by its base only or adnate by its sides also; its pericarp crustaceous, rarely coriaceous or osseous. *Seeds* 1 or 2, with membranous testa; the cotyledons fleshy, plano-convex, sometimes lobed or ruminate; radicle minute.

CONSPECTUS OF THE SECTIONS OF THE GENUS.

Section I. Lepidobalanus.—Male spikes simple, slender, lax, pendulous; involucres of fruit cup-shaped, the apices of the scales free, imbricate, solitary, sub-sessile, usually in short spikes; leaves dentate or lobed.

Section II. Cyclobalanopsis.—Male spikes pendulous and otherwise as in *Lepidobalanus.* Involucres forming a cupule the bracts of which are united to form concentric laminæ or zones with entire, crenate, or denticulate edges; leaves dentate or serrate, never entire.

Section III Pasania.—Male spikes erect, simple or panicled, female flowers in short distinct spikes or at the base of some of the male panicles; involucres solitary or in groups of three, cup-shaped, saucer-shaped, or discoid; the bracts imbricate, free, or united by their bases only, the apices always free; leaves entire.

Section IV. Cyclobalanus.—Male spikes erect; styles and leaves as in *Pasania;* involucres cupulate, solitary, or in threes; their bracts connate into entire or denticulate lamellæ as in *Cyclobalanopsis;* leaves entire.

Section V. Chamydobalanus.—Spikes erect; male flowers, styles and leaves as in *Pasania.* Involucres ovoid or globose, externally zonate or tubercular, closed and enveloping the whole glans (except the apex in *confragosa* and *Blumeana*), but not adnate to it except at the base; the glans escaping from the cupule when ripe.

Section VI. Lithocarpus.—Spikes erect; styles and leaves as in *Pasania.* Involucres large, thick, woody, ovoid or sub-globose, concentrically or obliquely zonate, or tubercled, completely enveloping the glans (except in *costata* and *rotundata*, where the apex is naked), and more or less adhering to it, not dehiscent; pericarp of glans osseous or granular, not polished where adherent to the involucre.

SECTION I.—LEPIDOBALANUS.

Lepidobalanus.—*Male spikes simple, slender, lax, pendulous; involucres of fruit usually in short spikes, cup-shaped; the apices of the scales free, imbricate, solitary, sub-sessile; leaves dentate or lobed.*

Acorns globular; cupule small, covering only base of glans; apices of its scales membranous; leaves entire or spinescent-dentate, blunt . . . . 1. *Q. semecarpifolia.*
Acorns sub-globular; cupule large, covering the whole of the glans except its apex; the scales woody, elongate, more or less reflexed; leaves acute or acuminate, setaceous-serrate . . . . 2. *Q. serrata.*

Acorns elongate-ovoid.

Leaves on same individual entire or spinose-dentate.

Leaves glabrous; nerves bifurcating short of the margin . . . . . . 3. *Q. dilatata.*
Under-surface of leaves stellate-tomentose; nerves not conspicuously bifurcate . . . . 4. *Q. Ilex.*
Leaves coarsely dentate-serrate, more or less obovate . . . . 5. *Q. Griffithii.*

Leaves serrate, oblong to lanceolate, not obovate.

Tomentum rufous . . . . 6. *Q. lanuginosa.*
" pale grey . . . . 7. *Q. incana.*

1. QUERCUS SEMECARPIFOLIA, *Smith in Rees' Encyc.* 29, *No.* 20.

Young branches puberulous. *Leaves* shortly petiolate, coriaceous, varying from elliptic or oblong to obovate-elliptic; the apex obtuse, rarely pungent-cuspidate; the base more or less subcordate or rounded; the edges entire, undulate, or spinescent-dentate; length of blade from 2 to 5 in.; breadth 1·25 to 2·5 in.; upper surface glabrous; lower minutely rufescent-tomentose, often sub-glabrous when old; nerves 6 to 8 pairs, prominent on the lower surface, conspicuously bifurcate far short of the margin; petioles ·25 in. long or shorter; stipules linear-oblong, scarious with pilose midrib, ·5 in. long, fugaceous. *Male spikes* sub-pendulous, crowded; the rachis pubescent; bracteoles short, broadly ovate ciliate; perianth cup-shaped, with 5—6 obtuse, slightly pilose segments; stamens 8 to 16; the anthers glabrous, broadly ovate. *Female inflorescence* few-flowered, short, erect; styles 3 to 5, linear, recurved. *Acorns* solitary; the cupule flat, small, thin, covering only the base of the glans; the scales ovate acute; their bases sericeous and connate; their apices free, membranous, sub-sericeous or glabrous; *glans* globular, smooth, 1 in. in diameter.—*Wall. Cat.* 2776 *A and B; Pl. Asiat. Rarior.* ii. 56. *t.* 174; *Miq. in Ann. Mus. Lugd. Bat.* i. 110; *Brandis For. Flora* 479. *t.* 64; *Wenzig Jahrb. Bot. Gart. Berl.* iv. 219; *Gamble Ind. Timbers* 382; *Hook Fl. Brit. Ind.* v. 601.—*Q. obtusifolia* and *Cassuru,* Don Prod. Fl. Nep. 56, 57.

The North-Western Himalaya from Afghanistan to Nepal, at elevations of from 6,000 to 12,000 feet. On the inner (absent from the outer) ranges of the North-Eastern Himalaya,—*Calcutta Bot. Gard. Collectors;* Bhotan (Woollaokka at 7,500 feet),—*Griffith,* (*Kew Distrib.*) 4553; Hills towards Bhotan,—*G. Mann.*

This is a gregarious, deciduous species. It is usually rather a small tree with tortuous, gnarled branches, but occasionally it attains a height of 80 or even 100 feet, and has then a fine clear stem. It varies greatly as to foliage, and in some of its smaller states it is, in the absence of acorns, with difficulty to be distinguished from *Q. Ilex,* Linn., with which, in point of fact, Griffith and others have confused it. The diagnostic mark given by Sir D. Brandis (l.c.) is the best for leaf specimens; and that mark is *the well-marked bifurcation of the main nerves far short of the margin of the leaf in this species,* whereas in *Q. Ilex* the nerves run to the margin of the leaf without bifurcating.

Fruitless specimens of what I take to be this species were collected by Dr. G. Watt on Sirhoiferar (a mountain on the Naga-Burman frontier) at an elevation of 10,000 feet (*Herb. Watt.* 5980.)

Plate 15A.—*Q. semecarpifolia,* Smith. 1, branch with male spikes; 2, branch with ripe fruit,—*of natural size;* 3, male flower: *enlarged.*

2. Quercus serrata, *Thunbg. var. Roxburghii; DC. Prod.* xvi. ii. 51.

Young shoots softly pubescent, but speedily glabrous. *Leaves* in old specimens on slender, rather long, petioles; shining, thinly coriaceous, oblong-lanceolate, acute or acuminate, serrate; the teeth long, setaceous; base entire rounded; adult leaves glabrous on both surfaces, with occasionally tufts of hairs in the axils of the nerves; young leaves softly sericeous below with a few adpressed hairs above; main lateral nerves 10 to 15 pairs, rather prominent, passing at an acute angle from the midrib into the marginal teeth of which they form the setæ; length of blade 3 to 6 in., breadth 1·6 to 2 in.; petiole 1 to 1·5 in. long; stipules oblong, pilose along the midrib externally, from ·5 in. to 1 in. long. *Male spikes* elongated; the rachis tomentose; bracteoles ovate-lanceolate, pubescent, much larger than the 5 or 6-lobed, pubescent perianth; anthers about 10, glabrous. *Female flowers* on short axillary spikes; styles filiform. *Acorns* solitary or in pairs, sessile or nearly so; *cupule* hard, woody, embracing the whole of the young and the lower three-fourths of the ripe glans; sub-hemispherical; 6 in. deep and from ·75 in. to 1 in. in diameter; the scales numerous, much imbricate, not adpressed, free, elongate (25 in.), ovate lanceolate, hoary, and with several vertical ridges outside; the lower rows much reflexed, the upper less so; *glans* sub-globose, apiculate, not much exceeding the cupule, smooth when ripe.—*Wenzig Jahrb. Bot. Gart. Berl.* iv. 221.—*Q. serrata,* Thunbg. Brandis

For. Flora 486; Hook. Fl. Br. Ind. v. 601; Gamble Man. Ind. Timb. 384.—*Q. Roxburghii*, Endl. Suppl. 4. 28.—*Q. polyantha*, Lindl. in Wall. Cat. 2771 A and B.

Kumaon, Nepal,—*Wallich*; Sikhim,—*J. D. Hooker*; Khasia and Naga Hills at elevations of from 4,000 to 6,000 feet, many collectors; Toungyi in the Shan Hills at an elevation of 5,000 feet,—*General H. Collett.*

A medium-sized deciduous tree very common in the Khasia Hills, much less so in Sikhim. General Collett's discovery of this species in the Shan Hills leads to the supposition that its distribution may extend to the hill ranges of Southern China.

The variety *Roxburghii* differs from the typical Japanese form of *Q. serrata* chiefly in having the scales of its cupules ovate-lanceolate instead of linear, and in also having broader stipules. Sir D. Brandis in his *Forest Flora* remarks that Roxburgh's drawing of the plant, called by him (*Fl. Ind.* iii. 674) *Q. serrata*, Thunb., is not this plant at all, but probably *Castanopsis indica*, A.DC. I entirely agree with this remark; and a perusal of Roxburgh's description of his *Q. serrata* shows that, while it does *not* fit *Q. serrata*, Thunbg., it answers very well for the young shoots and leaves (Roxburgh had seen no fruit) of *C. indica*, A.DC. The probability of this identification is increased by the fact that (unless this explanation be correct) Roxburgh's *Flora* contains no description of *C. indica*, A.DC., although it is one of the commonest trees of the region known to Roxburgh as Sylhet, and from which he described so many plants.

In what appear to be young leaf specimens of this from the Khasia Hills, the leaves are linear-oblong or obovate with very short petioles.

PLATE 16.—*Q. serrata*, Thunbg., var. Roxburghii, DC. 1, branch with ripe fruit; 2, branch with male spikes; 3, single male spike; 4, ripe fruit; 5, glans,—*all of natural size*; 6, male flower; 7, stamen: *enlarged.*

3. QUERCUS DILATATA, *Lindl. in Wall. Cat.* 2785.

Young parts glabrescent, ultimately all parts quite glabrous. *Leaves* sub-coriaceous, ovate-lanceolate, oblong to ovate-rotund, acute, rarely sub-obtuse; the edges entire or spinose-dentate; base rounded or sub-cordate; main nerves 8 to 12 pairs, not prominent and not bifurcate; reticulations minute, distinct; length 2 to 3 in., breadth 1 to 1·5 in.; petiole ·25 in. or less; stipules lanceolate, ·25 in. long. *Male spikes* slender, the flowers sparse; bracts ovate-acute; perianth obtusely 6-cleft, hairy externally; anthers 4 to 8, glabrous, apiculate. *Female inflorescence* short, few-flowered; styles 3 to 5, linear-clavate. *Acorns* generally solitary, sub-sessile; cupule hemispheric, nearly ·5 in. deep and rather more in diameter, embracing the lower half of the glans; its scales closely adpressed, woody, ovate-lanceolate, connate and pubescent below, free and sub-glabrous at the very tip; *glans* ovoid, apiculate, smooth, brown, twice (sometimes nearly two and a half times) longer than the cupule.—*Royle Ill. Him. Bot* 346. *t.* 84. *fig.* 2; (*sub. nom. dealbata*); *DC. Prod.* xvi. ii. 41; *Brandis For. Flora* 482; *Gamble Ind. Timb.* 383; *Hook. Fl. Brit. Ind.* v. 602; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 220.—*Q. floribunda*, Lindl. in Wall. Cat. 2773.

Eastern Afghanistan; Safedkoh; Suliman Range; the outer Himalayas as far east as Kumaon; at elevations of from about 4,000 to 9,000 feet.

This is a gregarious, evergreen tree, sometimes attaining a height of 80 feet. The leaves vary a good deal, those of young shoots often having spiny edges. They are always glabrous when adult, and nearly so when young. The glabrescent forms of *Q. semecarpifolia* resemble this, but are distinguishable by their boldly bifurcating nerves and rather more rigid texture.

PLATE 15B.—*Q. dilatata*, Lindl. 4, branch with spikes of male flowers; 5, branch with ripe fruit,—*of natural size;* 6 & 7, male flowers: *enlarged.*

4. QUERCUS ILEX, *Linn. Sp. Pl.* 995.

Young shoots and petioles stellate-pubescent. *Leaves* shortly petiolate, coriaceous, varying from oval, ovate-oblong, to elliptic-lanceolate, blunt or acute; edges entire or spinose-dentate; base rounded, sub-cordate or acute; upper surface stellate-pubescent when young, glabrous when adult; lower densely covered with minute, pale grey, stellate tomentum, or minutely scaly; lateral nerves 4 to 10 pairs, not prominent and not conspicuously bifurcate; length of blade 1·25 in. to 2·5 in., breadth ·75 in. to 1·75 in.; petiole about ·25 in. *Male spikes* rather short, crowded; bracts ovate-acute to obovate, pilose externally, as is the obtusely 5- to 6-lobed perianth; anthers 3 or more, shortly hairy. *Female spikes* short, erect, few-flowered; styles 3 to 5, linear, recurved, spreading. *Acorns* solitary or in pairs; the cupule campanulate or cylindric, ·5 in. deep by ·6 in. in diameter, embracing nearly the lower half of the ripe glans; its scales woody, adpressed, ovate-acute, diminishing in size upwards; connate and pubescent below; the tips free and glabrous. *Glans* cylindric, conic, pale brown, glabrous when quite ripe, 2½ or 3 times as long as the cupule.—*Linn. Sp. Pl. 2nd ed.* 1412; *Smith in Rees' Encyc.* 29. *No.* 32; *Reichb. Ic. Fl. Germ.* 1307. *t.* 642; *DC. Prod.* xvi. ii. 39; *Boiss. Fl. Or.* iv. 1168; *Kotschy Eichen t.* 38; *Brandis For. Flora* 480; *Gamble Ind. Timb.* 383; *Hook. Fl. Brit. Ind.* v. 602; *Nouv. Duham.* 7. *t.* 43.—*Q. calicina* and *expansa*, Poir. Dict. Suppl. 2. 217.—*Q. Baloot*, Griff. Itin. Not. 328; DC. Prod. xvi. ii. 38.—*Q. Balout*, Boiss. Fl. Or. iv. 1168; Wenzig in Jahrb. Bot. Gart. Berl. iv. 200.*

Afghanistan and the drier parts of the Himalaya as far east as the Sutlej, at elevations of 3,000 to 8,500 feet. Distribution: the Mediterranean region, Asia Minor, Lebanon.

A small tree, 20 to 40 feet high; sometimes higher, but more frequently rather a bush than a tree. The Indian specimens differ in no essential character from the European, but on the whole the leaves of the Indian are smaller, more oval, and their pubescence is paler. The Afghan plant, first collected by Griffith and regarded as a species by him (*Q. Baloot*), has the pubescence on the under surface of its leaves rather scaly than stellate; but I can see no other difference from *Q. Ilex.* It is, however, still kept distinct by De Candolle, Bossier, and Wenzig.

PLATE 17.—*Q. Ilex*, Linn. 1, branch with male catkins; 2, branch with broadly ovate leaves and ripe fruit; 3, branch with spinose-dentate leaves; 4, branch with lanceolate leaves and young fruit,—*all of natural size;* 5, male flower: *enlarged.*

5. QUERCUS GRIFFITHII, *Hook. fil. and Thoms. DC. Prod.* xvi. ii. 14.

Young shoots and petioles covered with grey pubescence; ultimately glabrescent or glabrous. *Leaves* obovate, obovate-oblong, or cuneate, acute or sub-acuminate, more or less coarsely dentate-serrate, sometimes entire towards the much narrowed base; upper surface more or less smooth and shining when adult, pubescent when young; lower surface minutely pubescent when adult, softly pubescent when young, often pale; nerves 12 to 16 pairs, bold and prominent; length of blade 5 to 8 in., breadth (at broadest part) 2·5 to 4 in.; petioles ·3 in. long; stipules linear, hairy, fugaceous, ·5 in. long. *Male spikes* crowded at the base of the young shoots, sub-pendulous; perianth deeply 5 to 6-cleft, hairy; stamens 8 to 12; the anthers broad, hairy. *Acorns* in clusters of 2 or 3 near the apices of the branches, sub-sessile; *the cupule* hemispherical, ·25 in. deep and about ·5 in. in diameter, slightly sericeous externally, nearly smooth internally; the scales closely adpressed, ovate-acuminate, not more than ·15 in. long; the upper rows the narrowest; *glans* twice as long as the cupule, elongate-ovoid, smooth; the united bases of the styles pubescent, persistent.—*Miquel in Ann. Mus. Lugd. Bat.* i. 104; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 218; *Gamb. Ind. Timb.* 381; *Hook. Fl. Br. Ind.* v. 602.

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* In the synonymy quoted above I have not given the names of those varieties of this species which do not occur within Indian limits.

Khasia Hills,—*Griffith, Simons, J. D. Hooker, Mann, Clarke and others;* Naga Hills,—*Watt, Prain, Clarke;* Burmah,—*Brandis.*

A considerable tree, growing at elevations of from 3,000 to 6,000 feet.

VAR. OBLONGA.

Leaves oblong, slightly obovate, shortly acuminate, sub-entire or slightly dentate; under surface puberulous or sub-glabrous, not pale.

Naga Hills at Kohima,—*C. B. Clarke* (41481); Khasia Hills,—*Mann.*

This is a very distinct and constant variety.

This species must come very near *Q. aliena*, Bl. Neither Blume's original description (*Mus. Bot. Lugd. Bat.* i. 286) nor De Candolle's (*Prod.* xvi. ii. 14) contains any account of the male flowers or acorns of *aliena.* There are, however, good specimens from the St. Petersburgh Museum in the collections at Kew, Calcutta, and in the British Museum; and, except that the acorns of *aliena* are rather larger than those of *Griffithii*, and that the leaves of *aliena* are generally more glabrous, I cannot see how the two differ. *Q. Griffithii* comes also near *Mongolica*, Fisch., *crispula*, Bl., and *grosse-serrata*, Bl.; and I think it highly probable that, when fuller materials are got together, it will be found that the foregoing are merely different names for one plant which is distributed from the Eastern Himalayas and the valley of the Bhramaputra and Irrawady to Mongolia and Japan.

PLATE 18.—*Q. Griffithii*, Hook fil. and Thoms. 1, branch with ripe acorns; 2 young branch with male spikes,—*of natural size;* 3, male flower; 4, male perianth (from another specimen); 5, stamens of No. 4; 6, acorn; 7, two scales from cupule: *enlarged.*

6. QUERCUS LANUGINOSA, *Don. Prodr. Fl. Nep.* 57.

Young shoots and leaves densely tawny or rufous-tomentose. *Leaves* coriaceous, oblong-lanceolate or elliptic-oblong, acute, coarsely serrate, especially in the upper two-thirds; the teeth triangular, not spinose; slightly narrowed and entire towards the obtuse or sub-acute, never cordate, base; the upper surface when adult glabrous; lower more or less tomentose, except the 9 to 14 pairs of stout nerves which are glabrous; length of blade 3·5 in. to 8 in., breadth 1·5 to 3·5 in.; petioles ·5 in. to ·75 in., tomentose; stipules ovate, hairy in the middle outside, the edges scarious. *Male spikes* crowded, much shorter than the leaves; bracteoles ovate-acute, ciliate; perianth broadly 5 to 6-cleft, pilose externally; anthers 7 to 10, glabrous. *Female inflorescence* few-flowered, tomentose; styles linear. *Acorns* solitary or in pairs, axillary, sessile; *cupule* woody, hemispheric,—embracing the lower half of the ovoid, umbonate glans; scales of the cupule adpressed, woody, ovate.—*DC. Prod.* xvi. ii. 51; *Brandis For. Flora* 481; *Gamble Ind. Timb.* 384; *Hook.*

Fl. Brit. Ind. v. 603.—*Q. lanata*, Sm. in Wall. Cat. 2772 A and B; Rees' Encyc. 29. 27; Wenzig in Jahrb. Bot. Gart. Berl. iv. 221 (excl. var. *incana*).—*Q. Banja*, Ham. MSS.

Nepal,—*Buchanan-Hamilton, Wallich, Scully;* Kumaon, at Nynee Tal, 7,000 feet,—*Thomson, King, Reid;* Bhotan. (*Kew Distrib.* 4450) the ascent to Chupcha at 7,500 feet,—*Griffith;* Hills towards Bhotan,—*G. Mann.*

This is a distinct and handsome species, and is by far the rarest of the Himalayan oaks. Its distribution appears to be very local, and good specimens of it have found their way into very few collections. In fact I have been able to find ripe fruit of it only in the British Museum and in specimens recently sent from Kumaon by Mr. Reid. Nobody who has ever seen the two growing would think of uniting this with *Q. incana*, Roxb.; and even leaf specimens of this can be distinguished in the Herbarium by their plentiful rufous tomentum, the vestiture of *incana* being more scanty and of a pale grey colour.

PLATE 19.—*Q. lanuginosa*, Don. 1, branch with male spikes; 2, branch with spike of young fruit; 3, cluster of young fruit; 4, cupule of ripe fruit,—*of natural size;* 5, male flowers; 6, female flowers: *enlarged three diameters;* 7, male flower; 8, female flower; 9, scales of cupule: *enlarged six diameters.*

7. QUERCUS INCANA, *Roxb. Hort. Beng.* 113.

Young shoots and leaves hoary-pubescent. *Leaves* coriaceous, ovate-lanceolate or oblong, acute or acuminate; the edges in the upper three-fourths sharply, but rather remotely, mucronate-serrate; the base rounded or acute, entire; upper surface glabrous; lower densely covered with minute, white, stellate tomentum; nerves 10 to 14 pairs, running almost straight from the midrib into the marginal teeth; length of blade 3 to 5, or rarely 6 in., breadth 1·5 in. to 2 in.; petiole about ·5 in; stipules linear, scarious, about ·5 in. long. *Male spikes* slender, more or less hoary; bracteoles broadly ovate; male perianth with 4 to 5 short, obtuse lobes, pilose externally; stamens 3 to 5; anthers glabrous, apiculate. *Female inflorescence* few-flowered, axillary, sessile; styles linear-clavate. *Acorns* solitary or in pairs, sessile or sub-sessile; *cupule* campanulate, embracing the entire glans when young, covering only half of it when adult, about ·5 in. in depth and breadth; the scales woody, sub-adpressed; the lower rows broadly ovate with thickened bases and blunt apices; the upper rows with thin sub-acute apices; all more or less rough externally and hoary; *glans* ovoid, at first tomentose, afterwards glabrous.—*Roxb. Fl. Ind.* iii. 642; *DC. Prod.* xvi. ii. 51; *Miq. Ann. Mus. Lugd. Bat.* i. 111; *Brandis For. Flora* 482; *Wall. Cat.* 2770; *Gamble Ind. Timb.* 384; *Hook. Fl. Br. Ind.* v. 602.—*Q. dealbata*, Wall. Cat. 2769.—?*Q. oblongata*, Don Prod. Fl. Nep. 57.—*Q. lanata*, Sm. in Rees' Encyc. 29. No. 27.—*Q. lanata*, Don. var. *incana*. Wenzig l.c. 222.

The outer ranges of the Himalaya from the Indus to Nepal, at elevations of from 3,000 to 8,000 feet; Shan States, Upper Burmah, at an elevation of 5,000 feet,—*General H. Collett.*

A deciduous tree, usually about 30, but sometimes 50 or 60 feet high; distinguishable from the preceding species by its hoary leaves. Wenzig regards *Q. incana* as a variety of *Q. lanuginosa*, Don., which he believes to be the tree described by Smith in *Rees' Encyclopædia* under the name of *Q. lanata.* Until the present year (1888) this species was believed to be confined to the North-Western Himalaya. But General Collett's specimens from the Shan Hills show that its distribution must be greatly wider.

PLATE 20.—*Q. incana*, Roxb. 1, branch with male spikes; 2, with ripe fruit,—*of natural size;* 3, young fruit; 4, male flower; 5, cupule: *enlarged.*

SECTION II.–CYCLOBALANOPSIS.

Cyclobalanopsis.—*Male spikes pendulous and otherwise as in* LEPIDOBALANUS. *Involucres forming a cupule, the bracts of which are united to form concentric laminæ or zones with entire crenate or denticulate edges; leaves dentate or serrate, never entire.*

- Glans ovoid or ovoid-cylindric.
  - Glans three-fourths covered by the cupule . . . . 8. *Q. oidocarpa.*
  - Glans more than twice as long as the cupule (*i.e.*, much exserted).
    - Leaves ovate-acuminate, tomentose beneath . . . . 9. *Q. Lowii.*
    - Leaves lanceolate.
      - Glans nearly 2 in. long . . . . 10. *Q. semiserrata.*
      - Glans less than 1 in. long . . . . 11. *Q. glauca.*
- Glans globose.
  - Leaves thinly coriaceous, entire or sub-repand towards the apex, the base acute . . . . 12. *Q. argentata.*
  - Leaves very coriaceous, entire, the base rounded . . . . 13. *Q. nitida.*
- Glans hemispheric.
  - Apex of glans conical, not depressed, smooth.
    - Leaves oblanceolate or elliptic-lanceolate, undulate, or coarsely serrate, glaucous beneath . . . . 14. *Q. Brandisiana.*
  - Apex of glans more or less depressed.
    - Leaves lanceolate, acuminate, glaucous beneath, sometimes entire . . . 15. *Q. lineata.*
    - Leaves ovate-lanceolate to oblong, blunt, not glaucous, coarsely serrate . 16. *Q. mespilifolia.*
- Glans turbinate.
  - Glans only half enveloped by the cupule.
    - Leaves ovate-lanceolate, blunt, tomentose beneath . . . . 17. *Q. Helferiana.*
    - Leaves lanceolate, acuminate, glabrous . . . . 18. *Q. velutina.*
  - Glans almost quite covered by the large, loosely-lamellate cupule . . . . . 19. *Q. lamellosa.*

8. Quercus oidocarpa, *Korth. in Verh. Nat. Gesch. Bot.* 216. *t.* 47. *f.* 18.

Young shoots puberulous, lenticellate. *Leaves* oblong-lanceolate, more or less acuminate, serrulate or undulate in the upper fourth; the base acute or acuminate, sometimes unequal; both surfaces glabrous, the upper shining; main nerves 8 to 12 pairs, slightly prominent on the under surface; length of blade 4·5 to 7 in., breadth 1·5 to 2·5 in.; petioles ·75 in. to 1 in., slender. *Male spikes* unknown. *Female spikes* solitary, shorter than the leaves; *cupules* sessile, obovoid or hemispheric, truncate when young, cylindric-hemispheric when adult and embracing three-fourths of the glans; 1 in. in diameter and about the same in depth; lamellæ 7 or 8, broad, minutely tomentose, the edges of the lower boldly crenate-denticulate, those of the upper sub-entire. *Glans* ovoid-cylindric, apiculate, minutely tomentose, 1·25 in. long and ·75 in. in diameter.—*Blume in Mus. Lugd. Bat.* i. 302; *DC. Prod.* xvi. ii. 99; *Miq. Fl. Ind. Bat.* i. 856; *Ann. Mus. Lugd. Bat.* i. 115; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 233; *Hook. fil. Fl. Br. Ind.* v. 603.

Sumatra,—*Korthals*, *Forbes* (585); Perak (*King's Collector*, 3723, 8258),—*Scortechini* (acorns only); Burmah (acorns only),—*Parish;* Borneo,—*Beccari* (P. B. 1876 and 2919).

Plate 21A.—*Q. oidocarpa*, Korth. 1, branch with one ripe and one nearly ripe acorn; 2, spike of young acorns; 3, half-ripe acorn: *all of natural size.*

9. Quercus Lowii, *nov. spec.*

Young shoots minutely cinereous-tomentose. *Leaves* coriaceous, narrowly ovate, bluntly acuminate, remotely serrate in the upper half; the base rounded or sometimes minutely cordate; upper surface, when old, glabrous, except the midrib, which, like the under surface and petiole, is minutely cinereous-tomentose; main nerves 7 pairs, slightly prominent below; length of blade 3 to 4 in., breadth 1·6 to 1·75 in.; petiole ·65 in. *Ripe cupules* ·6 in. in diameter and ·3 in. deep, minutely tomentose, cup-shaped, embracing only the lower fourth of the glans; lamellæ about 7, flat, crenulate. *Glans* ovoid-cylindric, slightly conic-apiculate; the base slightly narrowed, truncate, minutely scurfy-tomentose; nearly 1 in. in length and ·6 in. in diameter.

Borneo, on Kina Balu, at elevations of 5,000 to 6,000 feet,—*Low.*

A tree about 10 feet high.

I have seen only Sir Hugh Low's specimen of this very distinct species. Male flowers are unknown.

Plate 21B.—*Q. Lowii*, King. 4, leaf-twig with ripe fruit; 5, cupule; 6, glans: *of natural size.*

10. Quercus semi-serrata, *Roxb. Fl. Ind.* iii. 641.

Young shoots softly fulvous-tomentose, speedily glabrous and lenticellate. *Leaves* sub-coriaceous, oblong-lanceolate or oblanceolate, acute or shortly acuminate, coarsely serrate or sub-serrate in the upper half; the base acute or acuminate; upper surface glabrous, shining; lower glaucous or glaucescent; main nerves 9 to 11 pairs, straight, prominent beneath; length of blade 5 to 7 in., breadth 1·25 in. to 3 in.; petiole ·5 in. to nearly 1 in., rather slender. *Male spikes* pendulous, solitary, axillary, or in small fascicles, fulvous-tomentose. *Female spikes* solitary, axillary, little longer than the petioles, 2 to 3-flowered; the styles long, divaricating, bifid; the stigmas sub-capitate. *Cupules* sessile, solitary, hemispheric; the lamellæ about 6, the lower denticulate, the upper entire; broad, minutely fulvous-flocculent, tomentose at first, but ultimately glabrescent; when young embracing the whole glans except its apex; when adult 1 in. in diameter and ·6 in. deep, embracing only the base of the glans. *Glans*, when young, depressed, turbinate; when adult elongate; ovoid, apiculate, smooth, 1·75 in. long (including the apiculus) and ·75 in. in diameter.—*Wight Icon.* 211; *DC. Prod.* xvi. ii. 99; *Kurz F. Flor. B. Burm*, ii. 488; *Hook. Fl. Br. Ind.* v. 604; *Miq. Ann. Mus. Lugd. Bat.* i. 112.—*Q. Horsfieldii*, Miq. Fl. Ind. Bat. i. 856; DC. Prod. xvi. ii. 99.

Plains of Assam and Cachar, and on the Garo and Khasia Hills up to elevations of 2,000 to 3,000 feet,—*Mann*, *Fisher;* Burmah,—*Falconer*, *Brandis*, *Kurz*, *Gallatly;* Banka and Sumatra,—*Diepenhorst.*

A large tree. It has been suggested that *Q. velutina*, Lindl., is the same as this, and that when he described that species Lindley had before him only specimens of this in young fruit. In support of this view it must be admitted that the distinction on which Lindley relies most in distinguishing his *Q. velutina* is its depressed glans, and it is also true that the glans of *Q. semiserrata* when young is depressed. But as the fruit of *semiserrata* ripens the acorns elongate, and when mature they are four times as long as the cupule; while those of *velutina* remain permanently depressed-turbinate and half enveloped by the cupule. There are, however, other distinctions which I have noted under *velutina.* The opinion that the two are identical may have originated in the fact that Wallich issued as *velutina* some specimens which are *semiserrata* in young fruit.

It has also been suggested that *semiserrata*, Roxb., is the same as *Q. annulata*, Sm. (=*Q. glauca*, Thunbg.), but the differences between them appear to me to be considerable; moreover, the altitudinal range of the two is quite distinct—this being a tropical or sub-tropical tree, while that is a temperate or sub-temperate species. I cannot see how the specimens from Banka and Sumatra, which Miquel named *Q. Horsfieldii*, differ from *semiserrata* as described by Roxburgh, and I have therefore reduced that species here.

VAR. MANNII, *Hook. fil. Fl. Br. Ind.* v. 604.

Cupule with thick everted mouth, which is thickly covered with dense velvetty tomentum. Leaves 4 to 6 in. long, narrowed to the base; nerves straight, ascending, 14 to 12 pairs.

Assam, Makum Hills,—*Brandis;* Khasia Hills,—*G. Mann.*

PLATE 22.—*Q. semiserrata*, Roxb. 1, branch with ripe cupules; 2, ripe glans and cupule; 3, young acorns; 4, male spikes,—*all of natural size.*

11. QUERCUS GLAUCA, *Thunbg. Fl. Jap.* 175.

Young shoots sparsely pilose, speedily glabrous, and afterwards lenticellate. *Leaves* thinly coriaceous, oblong-lanceolate to ovate-lanceolate, rarely oblanceolate, acuminate, more or less sharply serrate in the upper half; the base acute acuminate or rounded; both surfaces at first sparsely pilose or sericeous, ultimately quite smooth; the lower glaucous; main nerves 10 to 15 pairs, prominent beneath; length of blade 3 to 4·5 in., breadth 1 in. to 1·5 in.; petioles ·5 in. to ·75 in., rather slender. *Male spikes* axillary, solitary, or in small lax panicles, sparsely sericeous, shorter than the leaves; flowers glomerulate, perianth 4 to 5-cleft; stamens 4 to 5, anthers broad. *Female spikes* (on different trees?) solitary, axillary, shorter than the leaves, 2 to 4-flowered.

Cupules sessile, hemispheric; the lamellæ from 5 to 8, flat; the lower denticulate; the upper sub-entire, puberulous when ripe, ·3 in. to ·5 in. in diameter and ·2 in. to ·3 in. deep. *Glans* much exserted, narrowly ovoid or cylindric-conic, apiculate, smooth, shining, ·6 in. to ·8 in. long, and ·3 in. to ·4 in. in diameter.—*Bank's Icon. Select. Kaempf.* t. 17; *Blume Mus. Lugd. Bat.* i. 289; *DC. Prod.* xvi. ii. 100 *with vars.; Sieb. and Zucc. Abhandl. Bayer. Acad.* 526; *Miq. in Ann. Mus. Lugd. Bat.* i. 115; *Franchet et Savatier Enum. Pl. Japan* i. 448; *Hook. Fl. Br. Ind.* v. 604; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 233.—*Q. annulata*, Sm. (not of Korth.) in Rees' Cycl. 29, No. 22; Wall. Cat. No. 2767; Miq. l.c. 114; DC. Prod. xvi. ii. 100; Brandis For. Flora (excl. syn. *semiserrata*, Roxb.) 488. t. 65; Gamble Ind. Timb. 387.—*Q. Phullata*, Ham. Don Prod. Fl. Nepal 57.—*Q. dentosa*, Wall. Cat. No. 2775, and *Q. laxiflora*, Lindl. in Wall. Cat. No. 2774; DC. Prod. xvi. ii. 108.

Valleys of the outer Himalaya from Hazara to Bhotan; Khasia Hills at elevations of about 5,000 feet. Distribution: Japan.

This is a widely distributed species, and presents some variety of form. As I have remarked under *Q. lineata*, Bl., I doubt whether it should not be united with that species. The only distinction between the two which appears to me to approach constancy is the form of the acorn. Loudon (*Encyc. of Trees*, 888) seems first to have suggested the identity of *annulata*, Sm. with *glauca*, Thunbg. Blume (in *Mus. Lugd. Bat.* i. 303) gives four varieties of this from Japan (viz. *nudata, fasciata, stenophylla*, and *caesia*). These forms differ chiefly in leaf characters: there are some excellent remarks upon them in Franchet and Savatier's work above quoted. *Q. annulata*, Korthals, is *Q. Teysmannii*, Blume.

PLATE 23.—*Q. glauca*, Thunbg. 1, branch with male spikes; 2, branch with acorns (*both from Wallich's specimen, Cat.* 2767*A*); 3, branch with ripe acorns from Sikkim; 4, branch with ripe acorns from Khasia: *all of natural size.*

12. QUERCUS ARGENTATA, *Korth. in Verh. Nat. Gesch. Bot.* 215. *t.* 47. *f.* 1-17.

Young shoots and rachises of the inflorescence glabrescent, much lenticellate. *Leaves* thinly coriaceous, long-petiolate, ovate-lanceolate, oblong-lanceolate or oblanceolate, entire, rarely sub-repand; the apex shortly caudate-acuminate; the base acute or acuminate, not rounded; upper surface glabrous, shining; the lower dull from the presence of a layer of minute silvery pubescence; nerves 12 to 15 pairs, sub-prominent below, rather straight; length of blade 4·5 to 6·5 in., breadth 1·7 in. to 2·2 in.; petiole ·7 in. to 1·1 in., slender. *Female spikes* (when young) much shorter than the leaves. *Cupules* solitary, sessile, minutely pubescent, sub-globular and enveloping all but the apex of the glans; lamellæ about 8, thin, broad, their edges denticulate. *Glans* globose, apiculate, smooth, shining. *Male spikes* unknown.—*Blume Mus. Lugd. Bat.* i. 229; *DC. Prod.* xvi. ii. 91; *Miq. Fl. Ind. Bat.* i. 658; *Ann. Mus. Lugd. Bat.* i. 115; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 230.

Sumatra;—*Korthals, Forbes* (2719, 2753).

This species is very poorly represented in collections, and I have nowhere seen ripe fruit. I give a figure of the ripest I have seen, and it is manifestly immature. The young twigs of this are remarkably lenticellate. The original specimens in Leiden bear the MSS. name *Q. caesia*. The *Quercus* named *argentata* in the late Dr. Hance's herbarium (now in the British Museum) does not appear to me to be the true plant of Korthals. It has a narrow, deep, sub-cylindric, boldly-lamellate cupule, from which half the glans is exserted. Signor Beccari's Bornean specimens (Nos. 2243 and 2251) come very near to this species, but they have much more coriaceous leaves, rounded, not narrowed at the base, with fewer nerves, longer petioles, and the bark of the branches is very scantily lenticellate. I have named Beccari's plant *Q. nivea.*

PLATE 24A.—*Q. argentata*, Korth. 1, branch with young fruit; 2, half-ripe acorn: *of natural size.*

13. QUERCUS NIVEA, *nov. spec.*

Bark of young branches very pale, glabrous, not lenticellate. *Leaves* on long slender petioles, rigidly coriaceous, ovate-lanceolate, acuminate; the edges entire, revolute; the base rounded or suddenly and slightly narrowed just above the petiole; upper surface glabrous and shining; the lower very pale, silvery, glaucous, especially when young; nerves 9 to 11 pairs, prominent and, like the midrib, at first minutely puberulous, afterwards glabrous and shining; length of blade 3·5 in. to 5 in., breadth 1 in. to 1·75 in.; petiole 1·25 in. to 1·75 in. *Spikes* unisexual; the male in few-branched, lax, pubescent, axillary, pendent panicles, shorter than the leaves; flowers distinctly glomerulate; perianth, stamens, anthers broad. *Female spikes* solitary, axillary, very short and few-flowered, or in a small panicle at the base of the current year's shoots. *Cupules* solitary, sessile, turbinate when young, when mature hemispheric, tapering to the base; lamellæ about 7, thin, broad, densely fulvous-pubescent; the edges scarious, erose, ·9 in. in diameter and ·7 in. deep. *Glans* globose, apiculate, shining, ·8 in. long and ·8 in. in diameter.

Borneo,—*Beccari* (*P. B.* 2243, 2551).

This resembles *Q. argentata*, Korth., but is distinguished from it in the points noted under that species. The leaves of this are beautifully white beneath, especially when young. The drooping male spikes with glomerulate male flowers mark it emphatically as a *Cyclobalanopsis*, in spite of its having entire leaves.

PLATE 24B.—*Q. nivea*, King. 3, branch with male spikes; 4, branch with young fruit; 5, branch with ripe acorn: *all of natural size.*

14. QUERCUS BRANDISIANA, *Kurz in Journ. As. Soc. Bengal* 1873, ii. 108; *For. Fl. B. Burm.* ii. 488.

Young branches cinereous, puberulous; the older lenticellate. *Leaves* coriaceous, obovate-lanceolate, rarely elliptic-lanceolate, slightly oblique, shortly and bluntly acuminate, undulate or coarsely sub-serrate in the upper two-thirds; the base acute or acuminate; upper surface glabrous; lower glaucous, deciduously puberulous; main nerves 10 to 14 pairs, rather straight, prominent, as are the minor veins on the under surface; length of blade 4 to 7 in., breadth 1·75 in. to 4 in.; petiole ·5 in. to ·75 in. *Male spikes* unknown. *Female spikes* solitary, axillary, two or three times as long as the petioles; the rachis swollen, minutely tomentose, few-flowered. *Cupules* sessile, hemispheric, embracing the lower two-thirds of the glans; lamellæ about 8, minutely tomentose; the lower erose-denticulate, the upper sub-entire; when ripe ·75 in. in diameter and ·5 in. deep. *Glans* conic-hemispheric, apiculate; the base truncate, smooth when ripe, ·5 in. in diameter and ·4 in. long.—*Hook. fil. Fl. Br. Ind.* v. 604.

Burmah, in the hill forests of Martaban, at elevations of 1,000 to 4,000 feet,—*Brandis, Kurz;* Shan Hills at 4,000 feet,—*General H. Collett.*

A species allied to *Q. mespilifolia* and *Helferiana*, and more distantly to *semiserrata.*

PLATE 25A.—*Q. Brandisiana*, Kurz. 1, twig with young female spikes; 2, spike of half-ripe acorns; 3, nearly ripe acorn: *of natural size.*

15. QUERCUS LINEATA, *Bl. Bijdr.* 523 (*not of Miq.*).

Young branches puberulous (tomentose in var. 4), lenticellate. Young *leaves* densely adpressed fulvous-sericeous, adult thinly coriaceous, from lanceolate to ovate or oblong-lanceolate, abruptly and shortly caudate-acuminate, entire or undulate towards the apex (serrate in some of the varieties); upper surface smooth, shining; lower glaucous, puberulous or minutely tomentose; main nerves 13 to 17 pairs, leaving the midrib at an acute angle and running nearly straight to the margin, slightly prominent on the upper, bold and prominent on the lower surface; length of blade 3 to 4·5 in., breadth 1·25 to 1·5 in.; petiole ·3 in. to ·5 in. *Male spikes* in small clusters, shorter than the leaves, fulvous, sericeous; flowers glomerulate; perianth of 4 pieces; stamens 4; anthers broad. *Female spikes* on different trees, solitary, axillary, shorter than the leaves, few-flowered, sericeous; flowers solitary; stigmas sub-capitate. *Young cupules* sessile, obovoid; the apex truncate, densely fulvous-tomentose; lamellæ from 5 to 7, broad; their edges (especially those of the lower two) denticulate or crenate. *Ripe cupule* cup-shaped or saucer-shaped, from ·6 in. to 1·2 in. in diameter. *Ripe glans* hemispheric, more or less depressed, apiculate, smooth, shining; the base truncate, from ·5 in. to 1 in. in diameter.—*Blume Fl. Jav. Cupul.* 32. *t.* 19; *Mus. Lugd. Bat.* i. 302; *Miq. Fl. Ind. Bat.* i. 855; *Ann. Mus. Lugd. Bat.* i. 114; *DC. Prod.* xvi. ii. 98; *Hook. fil. Fl. Br. Ind.* v. 605; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 232.—*Q. polyneura*, Miq. Pl. Jungh. i. 11.—*Q. oxyrhyncha*, Miq. Fl. Ind. Bat. Suppl. i. 347; Ann. Mus. Lugd. Bat. i. 113.

Blume described and figured his *Q. lineata*, and Miquel his two species *polyneura* and *oxyrhyncha*, without having seen either male spikes or ripe fruit, and no specimens with these parts are to be found in the collections at Leiden and Utrecht, where the types of Blume's and Miquel's species are deposited. Blume describes the leaves of *lineata* as "*serrulatis integerrimisve*," and in his plate he figures an entire-leaved form with young fruit attached, and a form with leaves serrulate towards the apex (fig. 1), but without fruit. He does not, however, refer to this fig. 1 in his text, and his specimens at Leiden have all entire leaves. I believe that this fig. 1 in reality belongs to his *Q. turbinata* which he figures on the preceding plate, and which I reduce as a variety of *lineata.* But although Blume's description and type specimens are so far incomplete, a comparison of them with the descriptions and type specimens reduced below convinces me that Dr. Wenzig (l.c.) is right in regarding them as only varieties of *Q. lineata*, Bl. I have made a careful examination of the extensive suite of specimens brought together in the Calcutta Herbarium, and a comparison of these with the materials at Kew, the British Museum, Utrecht, Geneva, and Florence not only confirms me in this opinion, but leads me to believe that *Q. glauca* and *Q. lineata* with their varieties are really but forms of one widely-distributed species which is found from Japan to Java, and runs westward along the Himalaya as far as Hazara. To unite these two would, however, cause much unsettlement of nomenclature, which it is perhaps for the present desirable to avoid. The only character on which reliance may be placed in separating *glauca* from *lineata* is in my opinion the shape of the glans. In *glauca* this is narrowly cylindric or ovoid-conic, much longer than broad; whereas in *lineata* it is hemispheric, usually depressed, and often broader than long. The species described as *Q. lineata* by Miquel (*Pl. Jungh.* 10) is, as he himself pointed out (*Ann. Mus. Lugd. Bat.* i. 117), *Q. Junghuhnii*, Miq.= *Q. acuminatissima*, DC. I do not see why *Q. Philippensis*, DC., (*Cuming*, No. 809) should not be reduced here. And I think *Q. Kamroopii*, Don. (*Prod. Fl. Nep.* 57), is probably one of the forms of this.

The varieties are as follow:—

VAR. 1. TYPICAL LINEATA, *Bl. l.c.*

Leaves entire.

Western Java, at altitudes of 5,000 to 6,000 feet,—*Blume*, *Teysmann*, *Junghuhn.*

VAR. 2. MERKUSII, *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 232 (excl. syn. *Horsfieldii*, Miq.). Leaves oblong-lanceolate, serrulate towards the acuminate apex; cupule turbinate.—*Q. turbinata*, Bl. (not of Roxb. or Liebm.) Bijdr. 523; Fl. Jav. Cupul. 31. t. 18; Mus. Lugd. Bat. i. 302; Miq. Fl. Ind. Bat. i. 856; Ann. Mus. Lugd. Bat. i. 114 (excl. syn. *Horsfieldii*, Miq.); DC. Prod. xvi. ii. 98.—*Q. Merkusii*, Endl. Gen. Pl. Suppl. 4. pt. 2. 28.

Java, Bangka; at high elevations.

This differs from typical *lineata* chiefly in its serrate leaves.

VAR. 3. OXYODON, *Wenzig l.c.* 232.

Leaves oblong-lanceolate, strongly spinose-serrate except at the base; under surface glaucous; ripe cupules hemispheric, thin; 7 in. in diameter and ·4 in. deep; lamellæ about 7, sub-entire, minutely tomentose. Glans hemispheric, the base truncate, smooth, ·6 in. in diameter and the same in height.—*Q. oxyodon*, Miq. in Ann. Mus. Lugd. Bat. i. 114; DC. Prod. l.c. 98.

Khasia, at elevations of 3,000 to 5,000 feet,—*Griffith*, *No.* 4457 (*Kew Dist.*), *Hooker*, *Mann*, *Clarke*, *No.* 40358; Naga Hills,—*Prain.*

VAR. 4. LOBBI, *Wenzig l.c.* 232.

Young branches, young cupules, and under surfaces of the leaves (even when adult) minutely fulvous-tomentose; secondary nerves transverse, very prominent; otherwise as in var. *oxyodon.*

Khasia Hills, at elevations of about 5,000 feet,—*Hooker*, *Mann*, and others. This variety is confined to the Khasia Hills.

VAR. 5. GRIFFITHII, *King in Hook fil. Fl. B. Ind. l.c.*

Leaves sub-entire, much acuminate; otherwise as in *oxyodon.*

Khasia Hills,—*Griffith*, *Nos.* 4454, 4480, 4485; *Mann*, *No.* 593: at elevations of 3,000 feet.

VAR. 6. THOMSONIANA, *Wenzig l.c.* 232.

Leaves ovate-lanceolate; serrulate in the upper half, usually glaucous beneath; ripe cupule saucer-shaped; the lamellæ minutely tomentose, much crenate, 1 to 1·2 in. in diameter, and only ·2 or ·3 in. deep. Glans turbinate, 1 in. in diameter and ·6 in. long.— *Q. Thomsoniana*, DC. Prod. xvi. ii. 98.

Sikkim, Himalaya, at elevations of 6,000 to 8,000 feet,—*Hooker, Gamble, King;* Bhotan,—*Griffith, No.* 4456.

VAR. 7. HILLDEBRANDI, *King in Hook. fil. Fl. B. Ind. l.c.*

Leaves elliptic-oblong, minutely serrate towards the acute apex; the base rounded, glaucous beneath; fruit large; ripe cupule saucer-shaped, contracted at the base, about 1·3 in. in diameter; lamellæ about ·6 in. crenate. Glans hemispheric, smooth, 1·2 in in diameter, ·8 in. long.

Burmah, Arakan Hills,—*Mr. H. H. Hilldebrand.*

PLATE 26.—*Q. lineata*, Bl. 1, twig of typical *Q. lineata*, Bl., with young fruit (*from Blume's specimen at Leiden*); 2, twig of var. *Merkusii*, Wenzig (from type specimen of *Q. turbinata*, Bl. at Leiden); 3, twig of var. *oxyodon* with ripe cupule and glans; 4, twig of var. *Lobbii* with young fruit; 5, twig of var. *Griffithii* with ripe fruit.

PLATE 27.—*Q. lineata*, Bl. 6, var. *Thomsoniana* with male spikes; 7, the same with female spikes; 8 & 9, the same with ripe cupule and glans; 10 to 12, leaves and ripe cupules and glans of var. *Hilldebrandi*,—*all of natural size.*

16. QUERCUS MESPILIFOLIA, *Wall. Cat.* 2766.

Young shoots minutely fulvous-tomentose. *Leaves* thinly coriaceous, ovate-lanceolate, oblong-lanceolate or oblong, slightly narrowed to the sub-obtuse or acute apex, coarsely serrate in the upper three-fourths; the base cuneate or rounded; upper surface glabrous, shining; the lower dull, deciduously tomentose on the midrib; otherwise glabrous; main nerves 12 to 16 pairs, prominent beneath; length of blade 5 to 8 in., breadth 2 to 2·75 in.; petiole about ·6 in. *Male flowers* unknown. *Cupules* hemispheric, embracing half of the glans, ·75 in. wide and ·5 in. deep; lamellæ about 10, flat, sub-entire, minutely tomentose. *Glans* cylindric-hemispheric; the apex depressed apiculate; the base truncate, minutely lepidote-tomentose when young, glabrous when old, ·6 in. in diameter and ·5 to ·6 in. high.—*DC. Prod.* xvi. ii. 102; *Kurz. F. Flor. B. Burm.* ii. 488; *Hook. fil. Fl. Br. Ind.* v. 605.

Burma, on Ava Hill,—*Wallich;* on the hills near Prome,—*Wallich, Kurz;* on the Arakan Hills,—*Kurz;* on the Burma-Manipur frontier,—*Watt*, 5120, 6614, 6615; at elevations of from 3,000 to 5,000 feet.

Wallich's, Kurz's, and Watt's specimens are all in adult leaf, and the fruits are detached: there is, therefore, some uncertainty as to the leaves and fruit belonging to the same plant. Mr. Gallatly, collecting for the Calcutta Garden, sent from Taepo (elevation 4,000 feet), young leaves with male spikes of an oak which I think it probable belongs to this; but the leaves are too immature for absolute determination. If these Taepo specimens do belong, then *Q. mespilifolia* is a *Cyclobalanopsis;* for the tomentose male spikes are pendulous, and fascicled at the base of the youngest branches. The flowers have a 4-cleft perianth and 8 stamens.

PLATE 28.—*Q. mespilifolia*, Wall. 1, leafy branch from Wallich's specimen 2776B; 2, leaf from his 2776A; 3, acorns, cupules, and glans from Dr. Watt's specimen No. 5120; 4, male spikes from Gallatly's No. 735: *all of natural size.*

17. Quercus Helferiana, *DC. Prod.* xvi. ii. 101.

Young branches and the under surface of the leaves, even when adult, rusty-tomentose. *Leaves* coriaceous, ovate-lanceolate or elliptic, acute or sub-obtuse; the upper three-fourths coarsely serrate; the base rounded or sub-cuneate; upper surface smooth and shining, except the midrib and nerves which, when young, are laxly sericeous; lower surface densely tomentose; main nerves 9 to 12 pairs, prominent beneath; length of blade 5 to 7 in.; breadth 2 to 3 in.; petioles ·5 in. to ·75 in. stout. *Male spikes* unknown [*Female spikes* (fide De Candolle) equal to the petiole, few-flowered]; *cupules* thick, flat, patelliform; the edge incurved, 1 in. in diameter and only ·15 in. deep; lamellæ about 9, conspicuously, densely, but minutely tomentose. *Glans* turbinate, hemispheric, apiculate; the base truncate, ·75 in. in diameter and ·4 in. high, minutely and deciduously lepidote-tomentose.—*Hook. fil. Fl. Br. Ind.* v. 605.

Burmah; Moulmein,—*Helfer* (*No.* 122), *Brandis;* on the Burma-Manipur frontier at Muku,—*Watt* (*Nos.* 5073 *and* 6648); at elevations of from 2,500 to 3,000 feet.

A small tree, affecting dry exposed places. Helfer's specimen, on which De Candolle founded this species, has only young fruit. Watt's specimens have ripe fruit (detached), and from these I have described it. The species is very closely allied to *Q. mespilifolia*, Wall., but is distinguished from that by the permanently tomentose under surfaces of the leaves, by the broad flat cupule and depressed glans. The materials of both species are, however, very scanty, and the ampler materials which will doubtless soon be forthcoming when the Burmese forests are better known may show that they are but forms of one plant.

Plate 25B.—*Q. Helferiana*, DC. 4, apex of a branch; 5 & 6, ripe acorns; 7, cupule seen from below; 8, glans,—*all of natural size.*

18. Quercus velutina, *Lindl. in Wall. Pl. Asiat. Rar.* ii. 41. t. 150.

Young branches deciduously fulvous-sericeous. *Leaves* membranous, oblong-lanceolate, sometimes slightly oblique, shortly but sharply acuminate, remotely serrate in the upper half; the base acuminate; both surfaces glabrous, shining; main nerves 10 to 12 pairs, thin, but prominent below, curving; length of blade 4 to 6 in., breadth 1·2 in. to 2 in.; petiole about ·4 in., minutely flocculent-tomentose. *Male spikes* pendulous, axillary, and in fascicles from the base of the annual shoots; rachis sericeous; perianth 4-cleft; stamens 8; anthers sub-globular, sericeous. *Female spikes* under 2 in. long, solitary, axillary, 2 to 3-flowered; styles short, thick, not divaricating. *Cupules*, when young, obovoid, truncate; when adult shallow-campanulate, embracing the lower half of the glans, not contracted at the base, fulvous-tomentose at all ages; the lamellæ 6 or 7, conspicuously denticulate, broad, 1 in. to 1·2 in. in diameter, ·5 in. deep. *Glans* depressed-turbinate, scarcely apiculate, minutely lepidote-tomentose, ·8 in. to 1 in. in diameter and ·5 in. high.—*DC. Prod.* xvi. ii. 99; *Miq. Ann. Mus. Lugd. Bat.* i. 115; *Kurz l.c.* 487, *in part; Wenzig Jahrb. Bot. Gart. Berl.* iv. 236; *Hook. fil. Fl. Br. Ind.* v. 606.

Chittagong Hill Tracts,—*Dowling, Lister, Gamble;* on low hills at elevations up to 1,000 feet,—*Calcutta Bot. Gard. Collector, Nos.* 477, 545.

Burmah (Pegu Province),—*Brandis, Kurz.*

A tree from 60 to 80 feet high. The old leaves of this are often nearly entire, and the lower part of the midrib is in many leaves flocculent-tomentose like the petiole.

Specimens of this in flower and young fruit were collected by Messrs. Gamble and Lister some years ago at Kasalong and Rangamattia in the Chittagong Hill Tracts, and in the Calcutta Herbarium they were referred doubtfully to *Q. semiserrata*, Roxb.

The receipt during the past year from Mr. Dowling, of Kornafuli (Chittagong), of a large suite of fruiting specimens at all stages of development makes it clear that this is a well-marked and distinct species. The leaves of this, although rather like those of *Q. semiserrata*, Roxb., have a thinner texture, with finer and more curving nerves. This species is, however, better distinguished from *semiserrata* by its flocculent petioles, golden and persistently tomentose cupules with much serrated lamellæ, and by its flattened lepidote-tomentose glans half enclosed in the cupule.

PLATE 29A.—*Q. velutina*, Lindl. 1, branch with ripe fruit; 2, young fruit; 3, male spikes with old leaf,—*all of natural size.*

19. QUERCUS LAMELLOSA, *Smith in Rees' Cycl.* 29. *No.* 23.

Young parts flocculently fulvous-tomentose. *Leaves* coriaceous, oblong or elliptic; the apex acute or acuminate; the base acute, rarely obtuse, remotely and sharply serrate in the upper three-fourths; upper surface glabrous, lower glaucous, minutely puberulous on the nerves when young; main nerves 12 to 20 pairs, very bold and prominent below; the secondary nerves transverse, distinct; length of blade 7 to 9 or even 12 in., breadth 2·5 to 4·5 in.; petiole 1·25 in. to 1·75 in. *Male spikes* solitary, axillary, much shorter than the leaves; the rachis fulvous-tomentose; flowers sub-glomerulate. *Female spikes* (on different trees) very short, axillary, 3 to 4-flowered. *Cupules* very large, embracing two thirds of the glans, sessile, obovoid-truncate, and with few lamellæ when young, turbinate when adult; 2 in. to 2·5 in. in diameter and 1 in. to 1·5 in. deep; lamellæ about 10, thin, broad, minutely tomentose, finely serrate, their edges erose or sub-entire. *Glans* turbinate when ripe, apiculate, almost covered by the cupule; the exposed part tomentose when young, afterwards smooth; 1·5 in. in diameter and 1·25 in. deep.—*Wall. Cat.* 2777; *Lindl. in Wall. Pl. As. Rarior.* ii. 41. *t.* 149; *Hook. fil. et Cathc. Ill. Him. Pl. t.* 20; *Miq. in Ann. Mus. Lugd. Bat.* i. 114; *DC. Prod.* xvi. ii. 101 (excl. syn. *Q. Wallichiana*); *Brandis For. Flor.* 488; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 236.; *Gamble Ind. Timb.* 387 *Hook. fil. Fl. Br. Ind.* v. 606.—*Q. imbricata*, Ham. Don Prod. Fl. Nep. 57.—*Q. pauci-lamellosa*, DC. Prod. l.c. 101.—*Q. lamellata*, Roxb. Fl. Ind. iii. 641; Miq. Fl. Ind. Bat. i. 858; Ann. Mus. Lugd. Bat. i. 115.

Eastern Himalaya from Nepal to Bhotan at elevations of 5,000 to 8,000 feet; Naga Hills,—*Watt*, *Clarke*, *Prain;* Duffla Hills,—*Lister*.

A magnificent tree, from 80 to 120 feet high. In the size of its acorns and leaves this rivals the tropical Malayan species *cyclophora*, from which, however, it is perfectly distinct. I have little doubt that Roxburgh's species *Q. lamellata* falls here. Roxburgh's description is too brief for identification, but his figure of the acorn in the Calcutta Herbarium, named by his own hand, can belong to nothing else. By an error quite surprising in so accurate a writer, he attributes the species to Penang—an impossible habitat for so truly temperate a tree. M. De Candolle's species *pauci-lamellosa* is, I am convinced, founded on specimens of this with immature fruit.

PLATE 30.—*Q. lamellosa*, Sm. 1, leaves and ripe acorn; 2, young acorns; 3, male inflorescence,—*all of natural size.*

SECTION III.–PASANIA.

Pasania.—*Male spikes erect, simple, or panicled; female flowers on short distinct spikes or at the base of some of the male panicles; involucres solitary or in groups of three, cup-shaped, saucer-shaped, or discoid: the bracts imbricate, free, or united by their bases only, the apices always free; leaves entire.*

Glans conspicuously longer than broad.

Glans cylindric-conic.

Leaves obovate to obovate-oblong . . . . 20. *Q. Lindleyana.*
,, broadly elliptic-oblong, puberulous . . . . 21. *Q. scyphigera.*
,, narrowly elliptic-oblong, glabrous, or glabrescent; cupule covering only a fifth of the glans . . . . 22. *Q. Kunstleri.*
,, oblong-lanceolate, always glabrous; cupule covering half the glans . . . . 23. *Q. Amherstiana.*

Glans ovoid.

Leaves elliptic-lanceolate, 6 to 12 in. long, glabrous; glans not much narrowed to the apex . . . . 24. *Q. acuminata.*
,, lanceolate or oblanceolate, narrowed to the base, 5 to 7 in. long; glans smooth, narrowed in upper half . . . . . 33. *Q. spicata*, vars. *Collettii and Chittagonga.*
,, oblong-lanceolate, 5 to 7 in. long; glans pubescent, much narrowed in the upper half; cupule with long spreading bristly tubercles . . . . 25. *Q. lappacea.*

Glans sub-globose, the base truncate.

Cupule wider than glans; its edge wavy . . . . 26. *Q. Falconeri.*

,, not wider than the base of the glans; edge not wavy.

Cupule flat, discoid; its bracts free, spreading, spiny . . . . 27. *Q. Scortechinii.*

,, saucer-shaped; its bracts broadly ovate, imbricate, adpressed.

Leaves oblong-lanceolate . . . . 28. *Q. pseudo-Molucca.*
,, dimorphous, ovate-lanceolate to ovate-rotund . . . . . 29. *Q. monticola.*

Glans hemispheric, not conspicuously longer than broad.

Cupule covering almost the whole of the glans.

Cupules always connate, leaves lanceolate . . . . 30. Q. *pachyphylla.*

Cupules crowded, connate or solitary.

Leaves glabrous . . . . 31. Q. *fenestrata.*
„ pale and minutely tomentose beneath . . . . 32. Q. *dealbata.*

Cupule covering only the lower part of the glans.

Leaves glabrous on both surfaces.

Leaves obovate, the base rounded or cordate, cupules mostly connate . . . . 33. Q. *spicata*, vars. *brevipetiolata* and *depressa.*

Leaves lanceolate or oblanceolate, not cordate at the base; cupules sometimes connate . . . . 32. Q. *spicata*, and its vars. *glaberrima*, *microcalyx*, and *gracilipes.*

Leaves elliptic-oblong, 9 to 15 in. long. . . . . 34. Q. *grandifrons*
„ ovate-lanceolate, cupule ·4 in. in diameter . . . . 35. Q. *polystachya.*
„ narrowly oblong-lanceolate; cupule ·7 to ·9 in. in diameter 36. Q. *celebica.*

Leaves glabrous on the upper surface.

Leaves lanceolate, caudate-acuminate; under surface pale, minutely puberulous . . . . 37. Q. *Wallichiana.*
„ elliptic, sub-obovate, cuspidate, glabrescent, or sparsely furfuraceous beneath; glans glabrous . . . . 38. Q. *Sundaica.*
„ elliptic-lanceolate with short blunt acumen, glabrescent beneath; glans minutely tomentose . . . . 39. Q. *Lamponga.*

Leaves more or less hairy on both surfaces.

Leaves hispidulous, and minutely tomentose, ovate-elliptic . . . 40. Q. *dasystachya.*
„ furfuraceous-pubescent, ovate-oblong, or elliptic-oblong . 41. Q. *hystrix.*

Glans turbinate.

Cupule embracing half the glans, faintly undulate, lamellate in its lower, squamose in its higher part . . . . 42. Q. *induta.*

Cupule saucer-shaped, embracing only the base of the glans.

Glans little more than half an inch in diameter . . . . 43. Q. *Curtisii.*

Glans an inch or more in diameter.

Scales of cupule broadly ovate with abrupt acute apices; all other parts quite glabrous. . . . . 28. Q. *pseudo-Molucca.*
„ of cupule broadly ovate with thick, blunt apices; young parts scurfy-pubescent . . . . 44. Q. *pruinosa.*
„ of cupule broad, tubercular; young parts puberulous, not scurfy . . . . 45. Q. *pallida.*

20. QUERCUS LINDLEYANA, *Wall. Cat.* 2782.

All the young parts, but especially the lower surfaces of the leaves, softly tawny tomentose. *Leaves* sub-coriaceous, obovate to obovate-oblong; the apex often shortly and abruptly acute; the edges undulate or entire; the base blunt; main nerves 10 to 12 pairs, rather prominent; adult leaves becoming almost glabrous above, except on the midrib; lower surface minutely tomentose when young, pubescent when old; length of blade 5 to 8 in., breadth 2·75 in. to 4 in.; petiole about ·35 in. stout. *Spikes* velvetty-tomentose, solitary or 1 or 2 in an axil, or terminal, about as long as the leaves. *Ripe fruit-spike* much longer than the leaves, very stout, pitted, cinereous-pubescent. *Cupules* sessile, hemispheric, from ·4 to ·5 in. in diameter, connate in glomeruli of 3 to 6, woody; the scales united in old cupules into 5 or 6 thick, wavy, unequal, broad, spongy, pubescent rings. *Glans* two-thirds exserted from the cupule, cylindro-conic, glabrous, about ·65 in. long.—*Kurz For. Fl. Burmah* ii. 486; *DC. Prod.* xvi. ii. 108; *Hance Journ. Bot. for* 1875, 136; *Hook. fil. Fl. Br. Ind.* v. 607.

Burmah,—Taong Dong; Ava,—*Wallich;* Lomatee,—*Gallatly, Collett.*

Kurz and Gallatly describe this as a small tree, 25 feet high (Kurz says it is evergreen). This is a very distinct species, but it is very badly represented in collections. M. De Candolle, having seen only an imperfect specimen of Wallich's, puts it amongst doubtful species. The Wallichian specimen in the Calcutta Herbarium has lamellate cupules, but all others which I have seen have the cupules of *Pasania.*

PLATE 55.—*Q. Lindleyana,* Wall. 1, branch with young spikes (*from Gallatly's specimen*); 2, old fruiting spike (*from Wall. Cat.* 2782); 3 & 4, young fruit spikes—*all of natural size.*

21. QUERCUS SCYPHIGERA, *Hance in Trim. Journ. Bot.* 1878, 199.

Young parts minutely ferrugineous-tomentose. *Leaves* coriaceous, elliptic-oblong, entire, shortly and suddenly acuminate; the base rounded or sub-acute; both surfaces dull when adult; the upper sub-glabrous except the midrib and 9 to 11 pairs of nerves which are minutely ferrugineous-tomentose; under surface minutely puberulous, pale; length of blade 7 to 10 in., breadth 2·5 in. to 3·5 in.; petiole ·35 in. stout. *Fruit-spikes* slender, longer than the leaves. *Cupules* solitary, cinereous-pubescent, cylindric-conic, ·35 in. deep and ·6 in. diameter; the bracts entirely connate except some of their linear apices which are free. *Glans* cylindric-conic, finely sericeous, ·5 in. in diameter and ·75 in. long. *Male spikes* unknown.

Bangka,—*Teysmann.*

The cupules of this species are intermediate between those of typical *Pasania* and typical *Cyclobalanus,* the bracts being arranged in indistinct zones, but their tips being free. The type specimen of this species is Herb. Hort. Bot. Bogor. No. 11403, which I have seen in Dr. Hance's and Sig. Beccari's collections. As pointed out by its author› this species comes near *Q. Amherstiana,* Wall., and *Q. Bancana,* Scheff.

VAR. RIEDELII, *King.*

Leaves broadly elliptic, sometimes almost rotund; upper surface shining.

Billiton,—*Teysmann* (*Herb. Hort. Bot. Bogor. No.* 11182) *Riedel.*

This variety is well marked by its leaves. In its fruit it does not differ from the typical form.

Plate 29 B.—*Q. scyphigera*, Hance. 1, branch with young fruit; 2, ripe glans (*from Herb. Hort. Bot. Rogor.* 11403); 3, ripe cupule,—*of natural size.*

22. Quercus Kunstleri, *King in Hook. fil. Fl. Br. Ind.* v. 606.

Young shoots minutely pubescent. *Leaves* thinly coriaceous sub-sessile, elliptic-oblong, acute, or shortly and bluntly cuspidate, entire; the base acute; nerves from 8 to 10 pairs prominent below; minutely pubescent when young, glabrous or glabrescent when adult, except the midrib, which on both sides is puberulous, the nerves very slightly so; length of blade 4·5 in. to 7·5 in., breadth 1·5 in. to 2 in.; petiole very short (·15 in.); stipules ovate-acute, striate, pubescent, caducous. *Spikes* axillary and solitary or terminal, and in fascicles of 3 or 4, much longer than the leaves, mostly male, a few androgynous; the rachis ridged, pubescent. *Male flowers* mostly solitary, bracteolate; the perianth with 5 or 6, erect, nearly smooth, lobes; stamens 8 to 10. *Female flowers* solitary; the perianth short, nearly smooth; styles 3, diverging. *Cupules* always solitary, sub-sessile, hemispheric; when young embracing a large part of the glans, when ripe only its lower fifth; ·5 in. in diameter and ·25 in. deep; the scales broadly ovate, closely adpressed, tesselate, rufous-tomentose; the apices acute and glabrous. *Glans* narrowly cylindric-conic, glabrous, crowned by the remains of the styles 1 in. or more long and ·35 in. in diameter.

Perak (*King's Collector*, *many numbers*),—*Scortechini*, *No.* 1567. From the sea level to elevations of 1,000 feet.

This is a very common tree; it has a spreading head, and attains a height of 40 to 50 feet. In general *facies* it is not unlike *Q. lappacea*, Roxb.; but it is much less hairy and has different fruit. It also comes very near *Q. Amherstiana*, Wall., but has a much narrower glans less covered by the cupule.

Plate 31.—*Q. Kunstleri*, King. 1, flower branch; 2, spike of young fruit; 3, mature fruit,—*all of natural size.*

23. Quercus Amherstiana, *Wall. Cat.* 2783 (*partly*).

All parts, except the female spikes, glabrous. *Leaves* thinly coriaceous, shining, lanceolate or oblong-lanceolate, acute or acuminate, entire; the base acuminate; nerves 10 to 12 pairs, rather prominent below; length of blade 4 to 7 in., breadth 1·75 to 2·25 in.; petioles about ·5 in. *Fruit* in stout, erect spikes, 6 to 9 in. long, rising from below the youngest branches. *Cupules* sessile, or nearly so, solitary, or in glomeruli of 2 or 3, hemispheric, woody, embracing the lower half of the ripe glans; ·5 in. deep and nearly ·75 in. in diam.; the bodies of the scales indistinct, not rusty, minutely tomentose externally and connate; the apices alone free and glabrous. *Glans* cylindric-conic, apiculate; the base truncate, covered with brown, scurfy, minute tomentum when young, glabrous when ripe; about 1 in. long and ·75 in. in diameter;—*DC. Prod.* xvi. ii. 83: *Kurz For. Flora Burmah* ii. 484; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 223; *Hook. fil. Fl. Br. Ind.* v. 607.

Burmah, at Amherst,—*Falconer;* Bithtako Range,—*Brandis.*

A large tree, said by Kurz to be ever-green. Very little is known of this species, which seems to be confined to the Tenasserim Province of Burmah. Good specimens of it are not common in collections, and I have seen none with male spikes attached.

Wallich, indeed, did issue, along with his fruiting specimens of this, some loose male inflorescences. But as he also distributed under the same number (2783) flowering male specimens of a plant notoriously different from this (*Q. mixta*, DC.), I think it safer to assume that some accident must have attended his distribution and to leave these male flowers undescribed.

PLATE 32A.—*Q. Amherstiana*, Wall. 1, branch with female spike; 2, two connate ripe fruits; 3, cupule; 4, glans; 5, spike with young fruits,—*all of natural size.*

24. QUERCUS ACUMINATA, *Roxb. Fl. Ind.* iii. 636.

Young shoots puberulous. *Leaves* thinly coriaceous, almost membranous, oblong-lanceolate or elliptic-lanceolate, shortly acuminate, entire; the base acute; both surfaces glabrous when old and almost concolorous; main nerves 10 to 12 pairs, prominent below; length of blade 6 to 12 in., breadth 2 to 4 in.; petiole about ·5 in. stout. *Male spikes* * * *. *Female spikes* solitary, axillary, shorter than the leaves; flowers solitary, sessile; styles long, diverging. *Cupule*, when young, turbinate, enveloping all the glans except its apex; the bracts elongate, hooked; ripe cupule cup-shaped, embracing half the glans, minutely tomentose, ·9 in. in diameter and ·35 in. deep; the bodies of the bracts united, their apices free and slightly hooked. *Glans* broadly ovoid, apiculate, crowned by the persistent styles, the base truncate, minutely scurfy-tomentose, ·9 in. long and ·8 in. in diameter.—*Wight Icon.* 221, *figs.* 6—9; *DC. Prod.*, xvi. ii. 90; *Miq. in Ann. Mus. Lugd. Bat.* i. 109; *Kurz. For. Flor. B. Burm.* ii. 484; *Hook. fil. Fl. Br. Ind.* v. 607.—*Q. fenestrata, Roxb.*, var. *acuminata*, Wenzig in Jahrb. Bot. Gart. Berl. iv. 224.

Chittagong Hill Tracts.

Originally collected by Roxburgh, but by nobody from his time until 1885, when specimens were sent to the Calcutta Herbarium by Mr. A. Dowling, of the Kornafulli tea plantation. Excellent specimens have now, however, been obtained by a collector sent out from the Calcutta Botanic Garden. The species is a very distinct one, and it does not, as has been suggested, much resemble *Q. fenestrata*, Roxb. Under his No. 3731, Wallich issued a plant which he considered to be *Q. acuminata*, Roxb. (*Q. glabra*, Herb. Ham.); but I have never seen this, and I cannot say whether it is true *Q. acuminata* of Roxburgh or not. An admirable coloured drawing of this species, made under Roxburgh's own supervision, exists in the Calcutta Herbarium.

PLATE 32B.—*Q. acuminata*, Roxb. 1, branch with spike of young fruit; 2, spike of fruit farther advanced; 3, ripe acorn,—*of natural size.*

25. QUERCUS LAPPACEA, *Roxb. Fl. Ind.* iii. 637.

Young shoots fulvous-pubescent; in the second year fuscous-pubescent. *Leaves* membranous, oblong-lanceolate, rarely oblanceolate, acuminate, entire; the base acute or subacute, sometimes slightly unequal; main nerves 11 to 13 pairs; upper surface, when adult, glabrescent, except the midrib and sometimes the nerves which are fuscous-pubescent; lower surface puberulous, especially on the nerves and midrib; length of blade 5 to 7 in., breadth 1·5 in. to 2 in.; petiole ·25 in.; stipules linear, caducous, pubescent. *Spikes* simple, solitary, axillary, as long as the leaves, or terminal and panicled, androgynous; the rachis fulvous-tomentose. *Male flowers* in glomerules or solitary; the perianth 5 to 6-lobed; stamens 10 to 12. *Female flowers* and ripe fruit solitary. The *cupule* sessile, woody, cup-shaped, embracing the greater part of the unripe glans and half of the ripe glans, sub-ligneous, ·6 in. to ·8 in. in diameter, and from ·2 to ·4 in. deep; the tubercles (free apices of the bracts) long, thin, spreading. *Glans* ovoid-conic, much narrowed in the upper half, and crowned by the remains of the united styles, softly pubescent; length, when quite ripe, 1 in.—*Wight Icon.* 220; *Wall. Cat.* 2780; *DC. Prod.* xvi. ii. 87; *Kurz For. Flor. B. Burm.* ii. 484; *Wenzig* in *Jahrb. Bot. Gart. Berl.* iv. 223; *Gamb. Ind. Timb.* 386; *Hook. Fl. Br. Ind.* v. 607; *Wall. Cat.* (*indeterminatæ*) 9099.—*Q. hirsuta*, Lindl., Wall. Cat. 3734.—*Q. Mackiana*, Hook, Ic. Pl. t. 224.

Khasia Hills,—*Griffith, Hooker, Mann, Clarke;* Burmah,—*Helfer* (4461), *Brandis;* at elevations of from 2,000 to 4,000 feet; Perak,—*Scortechini*, (*King's Collector, No.* 3919).

The Perak specimens of this have larger leaves than those from Khasia. The acorns are also larger, and are covered to a greater extent by the cupule; but as they are all young, this may be a transitory condition.

This resembles some states of *Q. acuminata*, Roxb., but this is much more hairy, and the tubercles of its cupules are longer and softer than in that species.

Plate 33.—*Q. lappacea*, Roxb. 1, branch with two androgynous and one male spike; 2, spike of half-ripe fruit; 3, nearly ripe fruit of a Khasia specimen; 4, cupule of the same; 5, ripe glans of a Khasia specimen; 6, nearly ripe fruit of a Perak specimen,—*all of natural size;* 7 & 8, male flowers; 9 female flower: *enlarged.*

26. Quercus Falconeri, *Kurz in Journ. As. Soc. Bengal for* 1875, *pt.* ii. 197.

A glabrous tree. *Leaves* thinly coriaceous, shining, elongate-oblong, entire, slightly and equally narrowed to the acute base and apex; nerves 15 to 20 pairs, prominent on the lower, impressed on the upper surface; minor venation indistinct; length of blade 10 to 15 in., breadth 2·5 to 4 in.; petiole stout, ·5 in. or less. *Fruiting-spikes* stout, erect, 4 to 8 in. long, minutely pubescent. *Cupules* wider than the glans, almost sessile, solitary, woody, shallow, cup-shaped when young, saucer-shaped and with the edge slightly recurved when adult, less than ·5 in. deep and about 1 in. in diameter; the bodies of the scales distinct, but connate and rusty, puberulous at the base; their apices pointed, free, and glabrous; the disc by which the glans is attached large and convex. *Glans* sub-globular, apiculate, with a truncate base, nearly 1 in. in diameter, glabrous when ripe; styles persistent until the fruit is half ripe, 3, cylindric, slightly spreading.—*Kurz For. Fl. Burm.* ii. 485; *Hook. fil. Fl. Br. Ind.* v. 608.

Burmah, at Moulmein,—*Falconer, Kurz;* Mergui,—*Dr. J. Anderson.*

Kurz, who saw this growing at Moulmein, describes it as ever-green. It has been found nowhere except at Moulmein and Mergui. It resembles *Q. Amherstiana*, Wall., but has much larger leaves and more globular acorns, which are inserted in shallower, wider, rusty cupules, of which, when mature, the edges are recurved. In his original description of this species, Kurz erroneously gives Upper Assam as its habitat.

Plate 34.—*Q. Falconeri*, Kurz. 1, branch with young fruit; 2, ripe fruit; 3, an acorn nearly mature; 4, mature cupule with recurved edges (seen from below),—*all of natural size.*

27. Quercus Scortechinii, *King in Hook. fil. Fl. Br. Ind.* v. 608.

Leaves coriaceous, oblong or sub-obovate-oblong; apex blunt or sub-acute; edges entire, narrowed at the base to the stout, rather short, petiole; main nerves 9 to 10 pairs, not very prominent, glabrous on both surfaces; the upper shining, the lower dull; length of blade 5 or 6 in., breadth 1·6 in. to 2·2 in.; petioles about ·6 in. *Fruit* on simple terminal or axillary, erect, solitary spikes; the rachis stout, puberulous. *Cupules* woody, sessile, flat and discoid, sharply muricate externally, 1·25 in. in diameter, ·3 in. high, embracing only the base of the glans; the scales numerous, free, conical, spiny, pubescent. *Glans* cylindro-globular; the base truncate; the apex sometimes slightly depressed, and bearing in its centre the remains of the united styles, glabrous, 1 in. long and about 1·2 in. in diam.

Perak. In open jungle on a hillside at an elevation of about 3,200 feet (*King's Collector*, No. 2188).

Mr. Kunstler, in his field note on this, describes it as a tree nearly 100 feet high. It cannot be common, as he collected it only once. Male and female flowers are unknown. In its cupule this resembles *Q. pallida*, Bl., but the glans is quite different.

Plate 35A.—*Q. Scortechinii*, King. Branch with ripe fruit,—*of natural size.*

28. Quercus pseudo-Molucca, *Bl. in Batav. Verh.* ii. 214. *t.* 4.

All parts except the outside of the cupule quite glabrous. *Leaves* coriaceous, oblong-lanceolate to elliptic-oblong, shortly and bluntly acuminate, entire; the base acute or sub-acute, quite glabrous on both surfaces; the under surface glaucescent; main nerves about 10 to 12 pairs, not prominent; length of blade 4 to 8 in., breadth 1·5 to 2·5 in.; petiole about ·5 in. *Spikes* terminal, solitary, or in fascicles of 2 or 3; rachis of spikes smooth. *Male flowers* in glomeruli with lanceolate bracteoles; perianth with 6 narrow teeth; anthers 8 to 10. *Female flowers* mostly solitary. *Fruit* sub-sessile, usually solitary. *Cupule* woody, saucer-shaped, flat; the edge only often slightly up-turned, and embracing the base only of the glans, 1 to 1·25 in. broad, ·2 in. deep; the scales minutely tomentose, broadly ovate, with abruptly acute apices, imbricate; closely adpressed and connate except the extreme tips. *Glans* globose or depressed-globose, apiculate, sometimes sub-conic, crowned by the remains of the conjoined styles; the base truncate, about ·6 in. high and 1 in. in diameter, covered with minute yellowish hair when young, glabrous when adult.—*Bl. Bijdr.* 519; *Fl. Jav. Cupul.* 14. *t.* 6; *Mus. Bot.* i. 291 (*with the varieties*); *Miq. Fl. Ind. Bat.* i. 849, *in Ann. Mus. Lugd. Bat.* i. 108 (*excl. syn. pallida*); *DC. Prod.* xvi. ii. 86; *Oudem. Annot. Cup. Jav.* 7. *t.* 5; *Wenzig Jahrb. Bot. Gart. Berl.* i. 226 [*incl. var. angustata, partly* (*excl. other var.*)].—*Q. angustata*, Bl. Bot. Verh. ix. 212. *t.* 3; Bijdr. 520; Fl. Jav. Cupul. 15. t. 7.—*Q. thelecarpa*, Miq. Pl. Jungh. 9; Fl. Ind. Bat. i. 851,—var. *angustata*, Miq. l.c. 852.

The Preanger Province in West Java,—*Blume, Junghuhn*; Celebes,—*Teysmann*; Mount Singalan in Sumatra, at an elevation of nearly 5,000 feet,—*Sig. Beccari* (*Herb. Becc. P. S. No.* 74.)

The form with narrowly lanceolate leaves and oblong-conic glans was separated as a species with some hesitation by Blume under the name *augustata*. Zollinger's specimen No. 1956, named *pruinosa*, is not true *pruinosa*, Bl., but belongs to this species.

PLATE 36.—*Q. pseudo-Molucca*, Bl. 1, flowering branch; 2, young fruit-spike; 3, ripe fruit-spike; 4, ripe fruit; 5, cupule,—*all of natural size, and copied from Blume and Oudemans;* 6, fruiting-branch; 7 & 8, ripe glans; 9, young connate fruit,—*all of natural size, and from Beccari's P. S. No.* 74.

29. QUERCUS MONTICOLA, *nov. spec.*

Young shoots with dark-coloured, striate, slightly pubescent bark. *Leaves* coriaceous, rigid; those on the young shoots ovate or ovate-lanceolate, with a short, blunt acumen; those on the older branches ovate-rotund, blunt; the edges of all entire, slightly narrowed at the base to the very short, stout petiole; main nerves 5 to 7 pairs; slightly prominent beneath; upper surface glabrous and shining; lower pale, and covered with minute stellate pubescence; the midrib and nerves sub-glabrous; length of the ovate leaves 2·5 in., of the ovate-rotund 1·75 in., breadth of both about 1·25 in.; petiole about ·2 in. *Fruit* on short, erect spikes. *Cupules* solitary, sessile, woody, saucer-shaped, about 1 in. in diameter and ·25 in. deep, embracing the lower third of the glans, pubescent; the scales numerous, broadly ovate, with abrupt lanceolate apices, imbricate, closely adpressed; the bases connate; the apices free. *Glans* glabrous, globose; the base truncate; the apex slightly conical, and crowned by the short, little divergent styles.

Mount Singalan in Sumatra, at an elevation of 8,000 feet,—*Sig. Beccari* (*Herb. Becc. P. S. No.* 275); Borneo, at 11,000 feet,—*Low.*

The rigid habit and rounded leaves of the adult branches of this remind one of some of the broad, entire-leaved forms of *Q. Ilex*, L. The fruit, however, is much larger and very different in form. Flowers of this are unknown.

PLATE 37.—*Q. monticola*, King. 1, adult fruiting-branch; 2, acorn seen from above; 3, cupule seen from below; 4, twig from another branch,—*all of natural size.*

30. QUERCUS PACHYPHYLLA, *Kurz in Journ. As. Soc. Bengal for* 1875, *pt.* 2. 197. *t.* xiv. *figs.* 1 to 4.

Young shoots striate, puberulous. *Leaves* coriaceous, oblong-lanceolate, rarely elliptic, acuminate or caudate-acuminate, entire; the base acute, rather unequal; main nerves 8 or 9 pairs; upper surface glabrous, shining; lower pale, dull, uniformly covered, except the nerves and midrib, by a coating of very minute stellate hair; length of blade 4·5 to 7 in., breadth 1·5 to 1·75 in.; petiole ·35 in. to ·5 in., stout. *Spikes* solitary and axillary or terminal and fascicled, longer than the leaves; mostly male, a few androgynous; rachis pubescent. *Male flowers* glomerulate; the perianth 5 to 6-toothed; stamens 10 or 12. *Female flowers* connate in groups of 3; stigmas 3, erecto-patent. *Fruiting-spike* stout, erect; ripe cupules crowded, connate into masses of 3 or 6, woody, hemispheric, each from 1 in. to 1·5 in. in diameter, closely embracing the greater part of the glans; the lower rows of scales completely fused together; the upper in pseudo-zones, closely adpressed; their connate bases broadly ovate, trigonous, rough, pubescent; the short acute apices alone free. *Glans* depressed-globose, glabrous, shining, crowned by the remains of the united styles, about 1 in. in diameter.—*Gamb. Ind. Timb.* 386; *Hook. fil. Fl. Br. Ind.* v. 608.—*Q. Andersoni*, King MSS. in Journ. Linn. Soc. xv. 125 (name only).

Sikkim, Himalaya, at elevations of from 6,500 to 9,000 feet,—*Anderson, Thomson, Mann, Gamble, King.*

VAR. FRUTICOSA, *Watt in Munipur Demarcation Report, ined.*

Leaves ovate-elliptic, acute; glans half exserted from the cupule; a bush.

Japoo, Ching Sow, and Sirhoifurar at elevations of from 8 to 9,500 feet on the Burma–Munipur Frontier,—*G. Watt.*

Leaf specimens which appear to belong to this species were collected in the Duffla Hills in Assam by Mr. J. L. Lister.

In Sikkim this forms a magnificent tall tree, but on the Eastern Munipur Frontier Dr. Watt found it only as a bush—a singular variation in habit within limits so narrow and under climatic conditions so similar. The tendency to aggomeration in the acorns is very strong in this species. Originally the female flowers are always in groups of three; but as the fruits ripen, neighbouring groups often coalesce, so that large masses of from 6 to 9 aggomerate acorns are frequently to be met with.

PLATE 38.—*Q. pachyphylla*, Kurz. 1, branch with male and androgynous spikes; 2, young fruit; 3, mature fruit,—*all of natural size;* 4, male flower: *enlarged.*

31. QUERCUS FENESTRATA, *Roxb. Fl. Ind.* iii. 633.

Young shoots deciduously tawny-pubescent or glabrous; all other parts, except the inflorescence, glabrous. *Leaves* coriaceous, from narrowly oblong-lanceolate to elliptic-lanceolate, acuminate, entire; the base much narrowed; main nerves 10 to 12 pairs, rather thin, but prominent on the under surface; midrib sometimes slightly adpressed-pubescent below; length of blade 6 to 8 in., breadth 1·15 to 3 in.; petiole ·4 in. to ·6 in. long; stipules linear-lanceolate, pilose, ·35 in. long. *Inflorescence* in terminal panicles or fascicles as long as the leaves, or longer, bearing both male and female flowers, minutely tomentose. *Male flowers* in 2 to 3-flowered, minutely 3-bracteolate, glomeruli; perianth 5 or 6-lobed, tomentose externally; anthers about 12. *Female flowers* in 1-bracteolate glomerules of 3. *Ripe fruit* solitary by abortion, or in threes, much crowded. *Cupules* almost completely enveloping the sub-globular, apiculate glans, thin and crustaceous in texture; the scales ovate-acute; their bases completely connate and rufous-pubescent externally; their apices free, subulate, and hooked. *Glans* ·65 in. to ·8 in. in diameter, smooth.—*Wight Ic.* 219; *DC. Prod.* xvi. ii. 84; *Kurz For. Fl. Burm.* ii. 483; *Gamble Ind. Timb.* 385; *Hook. fil. Fl. Br. Ind.* v. 608; *Wenzig* (excl. syn. *dealbata* and *acuminata*) *Jahrb. Bot. Gart. Berl.* iv. 224; *Wall. Cat.* 2784 (in part).—*Q. callicarpifolia*, Griff. Itin. Notes ii. 87, No. 1268 (in part).

Eastern Himalaya; Khasia and Naga Hills; Burmah (*Brandis*), at elevations of from 4,500 to 8,000 feet.

A tall evergreen tree, very common in Sikkim and in the Khasia Hills. There is considerable variation in the amount of the glans covered by the cupule. In most cases only the conjoined styles and the very apex of the glans are uncovered by the cupule: in a few the upper third, and in an extremely small number the upper half, of the glans is naked. The latter somewhat resemble the fruit of *Q. spicata*, Sm. There is also some variability in the breadth of the leaves. The typical form of leaf is narrowly lanceolate, not more than 1·5 in. broad, but at the upper limits of the species in Sikkim the leaves are elliptic-lanceolate and 3 inches or more broad. These broad-leaved individuals have sometimes been supposed to belong to the species found by Roxburgh in Chittagong, and named by him *Q. acuminata* (*Fl. Ind.* iii. 636). Specimens of the true Roxburghian *acuminata* exist in no European collection which I have consulted, and, until lately, there were none in the Calcutta Herbarium. I was therefore at one time inclined to believe that Roxburgh must have described two plants under different names, calling his Sylhet specimens *Q. fenestrata*, and those from Chittagong *Q. acuminata;* and his descriptions in the *Flora Indica* and his drawings in the Calcutta Herbarium rather support this view. In order to settle this and some other matters connected with the botany of Chittagong—a region which, except by Sir J. D. Hooker, Dr. Thomson, and Mr. C. B. Clarke, has not been investigated since Roxburgh's time—I sent a native collector there two years ago. And, amongst the specimens collected by this man, there are excellent examples of *Q. acuminata*, Roxb., which having once been seen, the suggestion of the identity of *acuminata* and *fenestrata* disappears entirely from one's mind. Some of the specimens distributed by Wallich under his No. 2784 as *Q. fenestrata* are undoubtedly *Q. lanceæfolia*, Roxb.

PLATE 39.—*Q. fenestrata*, Roxb. 1, branch with inflorescence; 2, branch with ripe fruit; 3, 4, 5, fruiting-spikes in different stages of ripeness,—*all of natural size;* 6, female flowers: *enlarged.*

32. QUERCUS DEALBATA, *Hook. fil and Thoms. MSS.* (*not of Wall. or Royle*); *DC. Prod.* xvi. ii. 85.

Young shoots softly pubescent, sometimes furfuraceous. *Leaves* coriaceous, lanceolate, acute or acuminate, entire, the base acute; upper surface scurfy, puberulous when young, glabrous when adult; lower surface pale, minutely tomentose; main nerves 9 to 10 pairs, rather prominent below, as is the midrib; length of blade 3 to 5 in., breadth 1·15 in. to 2·25 in.; petiole ·3 in. to ·4 in. *Inflorescence* terminal, the spikes (of which one or two, and often more, bear female flowers) in panicles longer than the leaves. *Male flowers* sessile, in fascicles of 3, with three unequal bracteoles; perianth 6-partite; stamens about 10. *Female flowers* in fascicles of 3, connate by their bases; styles 3, linear. *Acorns* on a stout rachis, much crowded, solitary (by abortion), or two or three together. *Cupule* sessile, woody, enveloping the sub-globular or turbinate-pyriform *glans* except at its apex; ·5 to ·65 in. in diameter; its bracts pubescent outside, connate except the apices which are free and form short striate tubercles.—*Miq. in Ann. Mus. Lugd. Bat* i. 107; *Hook. fil. Fl. Br. Ind.* v. 609.—*Q. fenestrata*, Roxb., var. *dealbata*, Wenzig in Jahrb. Bot. Gart. Berl. iv. 224.—*Q. callicarpifolia*, Griff. Itin. Notes ii. 87, No. 1268, *in part.*

Khasia Hills, at elevations of from 3,000 to 6,000 feet,—*Griffith, Hooker, Clarke, Brandis, Mann*, and other collectors.

A form which has been collected by Messrs. Mann and Clarke differs sufficiently from the type to be characterised as a variety.

VAR. MANNII.

Flower spikes slender, more than twice as long as the broadly-lanceolate or ovate-lanceolate leaves; acorns cylindric-oblong, not turbinate.

Kamrup in Assam,—*G. Mann;* Munipur,—*C. B. Clarke, Nos.* 41992 *and* 42067.

De Candolle gives Nepal as a locality for this species on the authority of Wallich, but I have seen no specimen from anywhere except the Khasia and Munipur Hills. This species certainly does not occur in Sikkim, and it is unlikely that it should occur to the westward of that province.

The plant to which the name *dealbata* was given by Wallich (*Cat. No.* 2769) is true *Q. incana*, Roxb. Royle applied the name *dealbata* to his figure of *dilatata* (*Ill. t.* 84), probably by some mistake of his lithographer, for in his text (p. 346) the name *dilatata* is correctly given. I cannot agree with Wenzig in regarding this as a variety of *Q. fenestrata*, Roxb.

PLATE 40.—*Q. dealbata*, Hook. fil. and Thoms. 1, branch with young inflorescence; 2, branch with young fruit at various stages of maturity; 3, ripe fruit; 4, male spike of var. *Mannii;* 5, unripe acorns of the same,—*all of natural size;* 6 male flower: *enlarged.*

33. QUERCUS SPICATA, *Smith in Rees' Encyc.* 29. 12.

Young shoots sometimes puberulous; male inflorescence minutely tomentose: all other parts glabrous. *Leaves* coriaceous, shining, elliptic-oblong, oblong-lanceolate or obovate-oblong; the apex from sub-acute to obtusely acuminate; the edges entire, gradually narrowed to the acute, sometimes unequal, occasionally (in var. *brevi-petiolata*) minutely cordate base; main nerves 10 to 12 pairs; length of blade 4 to 8 in., breadth 1·5 to 3·5 in.; petiole ·2 in. to 1 in. *Spikes* in terminal panicles or fascicles, a few bearing female flowers, or solitary and axillary, about as long as the leaves; the rachis and male flowers minutely tomentose. *Male flowers* close together, bracteolate; perianth 6-cleft; anthers 10 to 12. *Female flowers* in glomeruli of 3, or distinct. *Ripe fruit* densely crowded on a stout, erect rachis. *Ripe cupules* solitary, or 2—3 connate, saucer-shaped, embracing at most only the lower third of the glans, and sometimes less; the scales ovate-lanceolate, adpressed, connate, pubescent when young, glabrous when adult. *Glans* ovoid-conic to depressed-globose, smooth when ripe.—*Don. Prod. Fl. Nep.* 56; *Wall. Pl. As. Rar.* i. 40. *t.* 46; *Miq. Fl. Ind. Bat.* i. 848; *Ann. Mus. Lugd. Bat.* i. 106; *DC. Prod.* xvi. ii. 85; *Kurz For. Fl. Burmah* ii. 486; *Brandis For. Flora* 489; *Gamble Ind. Timb.* 385; *Hook. fil. Fl. Br. Ind.* v. 609; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 224; *Wall. Cat.* 2781 *A and B; Oudem. Annot. Cupul. Jav.* 5, 6, *t.* i. *t.* iv. *fig.* 1.—*Q. Arcuala.* Ham. MSS. in Spreng. Syst. iii. 857; Bl. Mus. Bot. i. 290.—*Q. grandifolia*, Don. in Spreng. Syst. iii. 856; Prod. Fl. Nep. 57.—*Q. squamata*, Roxb. Fl. Ind. iii. 638; Wight Ic. 213.—*Q. elegans*, Bl. in Batav. Verh. ix. 208; Bijdr. 518; Fl. Jav. Cupul. 21. t. 10; Oudem. Annot. Cup. Javan. 5, 6, t. ii and iii.—*Q. pyrifolia*, Bat. Bl. Mus. Lugd. Bat. i. 304; Miq. Fl. Ind. Bat. i. 864.—*Q. racemosa*, Jack in Mal. Misc.; Korth. in Verh. Nat. Gesch. Bot. 205.—*Q. Arcuala*, Ham., var. *racemosa*, Bl. in Mus. Bot. i. 290.

On the lower slopes of the outer Himalaya from Eastern Nepal, through Sikkim and Bhotan, to the Naga and Khasia ranges; Chittagong, Burmah, the Malayan Peninsula and Archipelago; at elevations of a few hundred to two or three thousand feet.

Of Blume's species *Q. pyrifolia*, there is only a leafy twig in his herbarium at Leiden, which I quite agree with M. De Candolle in referring to *Q. spicata*, Sm.

This is a widely distributed species, and it therefore presents a number of forms. The following, mostly distinguished by M. De Candolle, may be treated as more or less stable varieties:—

VAR. 1. GLABERRIMA, *DC.* (*not of Zoll.*) *Prod.* xvi. ii. 86 (*species*) ; *Blume in Bot. Verh.* ix. 210. *t.* 1.

Male inflorescence glabrous,—*Bijdr.* 517; *Fl. Jav. Cupul.* 17. *t.* 8; *Mus. Lugd. Bat.* i. 290; *Miq. Pl. Jungh.* i. 10.

Java and Sumatra.

VAR. 2. BREVI-PETIOLATA, *DC. l.c.*

Petiole very short (about ·25 in.); leaves usually more or less obovate; the base sometimes minutely cordate.

A common form in the Himalaya and Khasia mountains.

VAR. 3. GRACILIPES, *DC. l.c.* (*excl. syn. Q. turbinata,* Roxb.)

Leaves lanceolate or oblanceolate, gradually narrowed to the petiole, which is sometimes 1 in. long; cupules prominently tuberculate; glans not conical.—*Miq. in Fl. Ind. Bat. Suppl.* 347; *Ann. Mus. Lugd. Bat.* i. 106.

Khasia, Burmah, *rare;* Malayan Peninsula and Archipelago, *common.*

VAR. 4. DEPRESSA, *King.*

Leaves rounded at the base; ripe glans depressed, semi-globose; cupule saucer-shaped, flat, wide; fruit-spike short.—*Q. depressa,* Bl. Verh. Bat. ix. 209. t. 2.—*Q. placentaria,* Bl. Bijdr. 518; Fl. Jav. Cupul. 19. t. 9; Mus. Bot. i. 291; Miq. in Pl. Jungh. i. 10; DC. Prod. xvi. ii. 87; Wenzig Jahrb. Bot. Gart. Berl. i. 226.—*Q. spicata,* Sm., var. *placentaria,* Miq. in Ann. Mus. Lugd. Bat. i. 106; Fl. Ind. Bat. i. 849.

De Candolle and Wenzig keep this distinct from *Q. spicata,* Sm. There are no good specimens bearing this name in the collections at Kew, British Museum, Leiden, Geneva, or Calcutta, and our chief sources of knowledge of the species are Blume's description and coloured figure. And I am unable to see how these latter differ sufficiently from typical *Q. spicata* as to deserve specific rank.

VAR. 5. MICROCALYX, *DC. l.c.; Blume Mus. Lugd. Bat.* i. 290 (species).

Leaves small; fruit small (under ·5 in. in diameter); cupules often solitary or sub-connate; glans usually with conical apex.—*Q. microcalyx* et *anceps,* Korth. in Verh. Nat. Gesch. Bot. 204 and 206; Oudem. Annot. Cupul. Jav. 6. t. iv. fig. 3; DC. Prod. l.c. 86 (excl. syn. *Q. turbinata,* Roxb., and *Q. Thomsoni,* Miq.), *Q. Rhioensis,* Hance in Journ. Bot. for 1878, 198.

Khasia Hills common; also in Perak (*King's Collector, No.* 10947); in Rhio, Java, and Sumatra.

A very distinct variety; at once recognised by the small size of the leaves and fruit, by the cupules being little connate, and by the glans often having a conical apex.

VAR. 6. COLLETTII, *King in Hook fil. Fl. B. Ind.* v. 610.

Leaves lanceolate or oblanceolate, acute or acuminate, much narrowed to the base; acorns solitary (by abortion); cupule boldly tuberculate, sub-lamellate; glans ovoid-apiculate.

Naga Hills, Assam,—*Masters, Colonel H. Collett;* Manipur,—*C. B. Clarke,* (*Nos.* 41226, 42088, and 43473).

Good fruiting specimens of this very distinct variety were first collected by Colonel H. Collett during military operations near Kohima, and some of these were distributed under the provisional name of *Q. Collettii,* King MSS.

VAR. 7. CHITTAGONGA, *King in Hook. fil. Fl. B. Ind.* v. 610.

Leaves oblanceolate or lanceolate, much narrowed to the base; the petiole slender; acorns small, crowded, but not connate; cupules minutely tuberculate, not lamellate; glans ovoid, slightly apiculate.—*Q. mixta,* DC. Prod. xvi. ii. 83 (partly).

Chittagong (*Calcutta Botanic Garden Collector, Nos.* 324, 416, 478, 479, 480, and 522).

PLATE 41.—*Q. spicata,* Smith. Branches with flowers and ripe fruit. 1, section of ripe fruit,—*of natural size;* 2, male flowers,—*enlarged;* 3, leaf of var. *brevi-petiolata,*—*reduced in size.*

PLATE 42.—*Q. spicata,* Smith. 4, two leaves and fruiting-spike of var. *gracilipes;* 5, leaves and male spikes, and 6, ripe fruit of var. *Collettii;* 7, fruiting-spike and leaves of var. *Chittagonga,*—*all of natural size.*

PLATE 43.—*Q. spicata,* Smith. 8, var. *depressa, with ripe fruit;* 9, leaves and fruiting-spike of var. *microcalyx;* 10, leaf, and 11, fruit from another specimen,—*all of natural size.*

34. QUERCUS GRANDIFRONS, *King in Hook. fil. Fl. Br. Ind.* v. 610.

Young branches minutely puberulous; all other parts, except the inflorescence, glabrous. *Leaves* large, coriaceous, slightly inequilateral, shortly petiolate, oblong or elliptic; the apex rather suddenly, shortly, and bluntly caudate-acuminate; edges entire; very little narrowed towards the slightly unequal, sub-cordate, base; main nerves 12 to 20 pairs, bold and prominent on both surfaces, as are the wavy, transverse, secondary veins; upper surface shining; the lower dull, pale; length of blade 9 to 15 in., breadth 4 to 6 in.; petiole 5 in. or under, stout. *Spikes* mostly male, in large, open, terminal panicles; the rachises puberulous. *Male flowers* bracteolate, glomerulate; the perianth with 6 short, blunt lobes, pubescent externally; anthers about 12, rudimentary; pistil large, pale, hairy. *Female flowers* solitary, with short, truncate styes. *Fruit spikes* shorter than the leaves, bearing cupules only towards the apex. *Cupules* on short thick scaly pedicels, solitary, woody, sub-hemispheric, with incurved edge when young; when adult saucer-shaped, the edge not incurved, embracing only the lower fourth of the glans, ·8 in. in diameter and ·2 in. deep; the scales pubescent, ovate-acuminate, imbricate, closely adpressed; their bodies entirely connate, except the subulate apices which are free. *Glans* ovoid-conic when young; depressed, globose-conic when adult; the apex crowned by the thick remains of the united styles, glabrous, ·6 in. long and about the same in diameter.—*Hook. fil. Fl. Br. Ind.* v. 610.

Perak, at elevations of from 500 to 3,000 feet (*King's Collector, Nos.* 3766, 4867, 4872, 5365, 6544, 6604, and 7259),—*Scortechini* (*without number*).

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A fine tree, 50 to 100 feet in height. In its cupule this resembes *Sundaica*, as noted under that species. By its fruit it is also allied to *pseudo-Molucca*, Bl., and in its large leaves this much resembles *Q. elephantum*, a species collected by M. Pierre in Cambodia and described by the late Dr. Hance in *Trimen's Journal of Botany* for 1876, p. 365. But the leaves of *elephantum* are more gradually narrowed upwards, more cuneate and sub-cordate at the base, and not at all auriculate on one side, as are the leaves of this. Moreover, the cupule of *Q. elephantum* is lamellate (although faintly so); whereas the cupule of this is unmistakeably that of a *Pasania.* Finally, this has a glabrous glans, while that of *elephantum* is minutely sericeous.

PLATE 35B.—*Q. grandifrons*, King. 1, part of a branch; 2 & 3, young fruiting-spikes; 4, adult cupule and glans; 5, flower-spike,—*all of natural size.*

35. QUERCUS POLYSTACHYA, *Wall. Cat.* 2789.

Young shoots and rachises of inflorescence minutely tomentose; all other parts glabrous. *Leaves* thinly coriaceous, ovate-lanceolate, acuminate at base and apex, entire; the base decurrent on the petiole; main nerves 10 to 12 pairs, rather prominent beneath; both surfaces smooth: the lower pale and sometimes glaucescent; length of blade 5 to 7 in., breadth 2 to 2·5 in.; petiole ·5 to ·7 in. *Male and female flowers* in separate terminal panicles longer than the leaves: the female panicles less branched than the male. Male flowers in rather sparse glomeruli of 2 to 5; the perianth with 5 or 6 blunt lobes; rudimentary ovary large, globular, white, hairy; stamens about 12. *Female flowers* in rather distant glomeruli of 3. *Ripe fruits* on short, erect, thick, pitted rachises; the *cupules* sessile, connate; the bodies of the scales broad, connate, sericeous; their apices free and glabrous. *Ripe cupule* with 1 or 2 abortive ones at its base, sub-discoid, not so wide as, and embracing only the base of, the glans; ·4 in. in diameter and about ·1 in. deep. *Glans* sub-globular, apiculate, smooth, shining, about ·5 in. in diameter and the same in height.—*DC. Prod.* xvi. *pt.* ii. 107; *Kurz F. Flora Burm.* ii. 485; *Hook. fil. Fl. Br. Ind.* v. 610.—*Q. bancana*, Kurz (not of Scheffer) l.c. 485.

Burmah, Taong Dong,—*Wallich;* Lonkim Forest,—*Brandis;* Tongkyghat,—*Kurz* (No. 1000); Kongal on the Munipur-Burmah frontier,—*Watt* (No. 6616); Toungyi in Shan Hills, at 5,000 feet,—*General H. Collett.*

This is known only from Burmah, and is not well represented in collections. Kurz, who saw it growing, describes it as an evergreen tree in flower and fruit in November. Kurz confused some specimens of this bearing female panicles with *Q. bancana*, Scheff., of which he had never seen a specimen. I believe this tree to be truly diœcious.

PLATE 44.—*Q. polystachya*, Wall. 1, flowering branch; 2, female spikes; 3, spike of ripe fruit,—*all of natural size.*

36. QUERCUS CELEBICA, *Miq. in Ann. Mus. Lugd. Bat.* i. 110.

Young parts densely ferruginous-tomentose, ultimately all parts glabrous except the cupules. *Leaves* coriaceous, shortly petiolate, lanceolate or oblong-lanceolate, shortly and bluntly acuminate, entire; the base acute; upper surface shining, lower pale, dull and glaucescent; the nerves 9 to 11 pairs, bold and distinct below, obsolete above; length of blade 3 to 4 in., breadth 1·1 in.; petiole ·25 in., stout. *Spikes* short, axillary. *Cupules* sessile, saucer-shaped, ·7 to ·9 in. in diameter and ·25 in. deep; the scales numerous, in

8 or 9 verticels, broad, imbricate; their bases connate and fulvous-tomentose; the apices spiny and glabrous. *Glans* (fide Miquel) ovoid-acute.—*DC. Prod.* xvi. ii. 2. 95; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 228.

Celebes, Boeroe,—*Teysmann.*

Of this species there are at Leiden only three leaf specimens and two cupules, and there are only single specimens of it at Kew, the British Museum, and Calcutta. It is suspiciously like a small-leaved form of *Q. Sundaica*, Bl., but is rather more flocculent-tomentose when young. In the absence of proper material, I cannot form a decided opinion about this plant, and I prefer to keep up the species. M. De Candolle puts this in *Cyclobalanus*, but in the cupules, on all the authentic specimens which have any, the bracts have distinct apices as in *Pasania*. The bracts are indeed in verticels, but their bodies are not connate by their edges so as to form true lamellæ.

PLATE 45A.—*Q. Celebica*, Miq. 1, leaf-twig; 2 & 3, ripe cupules,—*of natural size.*

37. QUERCUS WALLICHIANA, *Lindl. in Wall. Cat. No.* 2778.

Young shoots and inflorescence at all ages minutely cinereous-tomentose. *Leaves* rigidly coriaceous, lanceolate, rather abruptly caudate-acuminate; the base acuminate; edges entire, undulate, slightly recurved when dry; upper surface glabrous and shining except the midrib and 10 to 12 pairs of nerves, which are minutely furfuraceous-puberulous on both surfaces and boldly prominent below; under surface uniformly covered between the nerves with very minute, pale pubescence; length of blade 4·5 in. to 7 in., breadth 1·5 to 1·75 in.; petiole ·3 to ·5 in. *Spikes* male or androgynous, solitary and axillary, or in small terminal panicles. *Male flowers* laxly glomerulate, sessile; the perianth 6-cleft; stamens 12. *Female flowers* connate in glomeruli of 3; the styles short, conical, erect, divergent. *Ripe cupules* crowded on spikes as long as the leaves, with thick short woody pedicels, discoid, ·5 to ·6 in. in diameter and ·1 to ·15 in. deep, embracing only the lower part of the glans, minutely tuberculate-tomentose; the bodies of the bracts broad and connate, their apices alone being free. *Glans* depressed, hemispherical; the apex conical, apiculate; the base truncate, minutely tomentose; length to apex ·4 in., diameter ·6 in.—*Hance in Seem. Journ. Bot.* viii. 4; *Trim. Journ. Bot. for* 1874, 241; *Hook. fil. Fl. Br. Ind.* v. 610.

Penang,—*Wallich*, *Maingay*, *King;* Malacca,—*Maingay* (1460-2, 1530), *Griffith* (No. 4467?); Perak,—*King's Collector* (many numbers); at elevations of from 500 to 2,000 feet; very common.

A tree, 30 to 60 feet high. Doubtless from some mixing of specimens or labels, M. De Candolle (*Prod.* xvi. ii. 101) reduces this species to *Q. lamellosa*, Sm., a Himalayan species quite unlike it. The real affinities of this are with *Q. lamponga*, Miq., and *Q. Sundaica*, Bl.

PLATE 46.—*Q. Wallichiana*, Lindl. 1, leaves and inflorescence; 2, spike of ripe acorns; 3, glans and cupule,—*of natural size.*

38. QUERCUS SUNDAICA, *Bl. Batav. Verh.* ix. 216.

Young branches minutely fulvous-tomentose. *Leaves* rather thinly coriaceous, elliptic, or elliptic-oblong, sometimes sub-obovate; acute, or shortly and obtusely cuspidate, entire, slightly narrowed towards the blunt or acute, occasionally unequal, base; somewhat furfuraceous-pubescent on both surfaces when young; when adult glabrous or glabrescent on the upper surface, except the midrib and nerves; the under surface pale, glabrous, glabrescent, or sparsely furfuraceous-pubescent, except the midrib and nerves, which, as on the upper surface, are fulvous-tomentose; length of blade 4 to 7 or even 9 in., breadth 2 in. to 3·5 in ; petiole nearly ·5 in. ; stipules lanceolate, pubescent, ·25 in. long. *Flower spikes* in large, open-branched, terminal or axillary panicles, which are much longer than the leaves: very few of them female. *Male flowers* solitary; the perianth spreading, 6-cleft; anthers about 12. *Spikes of ripe fruit* longer than the leaves, erect, stout. *Ripe cupules* on short, thick stalks, saucer-shaped, flat, ·6 in. to ·9 in. in diameter and ·1 in. deep; scales with broadly ovate, connate bodies and free, acute, spreading apices. *Glans* globose, conic, or ovoid-conic, with truncate base; the apex crowned by the remains of the united styles, glabrous, shining, about ·6 in. high.—*Bl. Bijdr.* 520; *Bl. Fl. Jav. Cupul.* 11. *t.* 2 and 3; *DC. Prod.* xvi. ii. 89; *Miq. Fl. Ind. Bat.* i. 850; *Ann. Mus. Lugd. Bat.* i. 109; *Oudem. Annot. Jav. Cup.* 11; *Hook. fil. Fl. Br. Ind.* v. 611.—*Q. mappacea*, Korth. Verh. Gesch. Bot. 202; Miq. Fl. Ind. Bat. i. 850.—*Q. Korthalsii*, var. *mappacea*, Bl. Mus. Bot. i. 293; DC. Prod. xvi. ii. 90.—*Q. pseudo-Molucca*, Bl., var. *Korthalsii* and *Sundaica*, Wenzig in Jahrb. Bot. Gart. Berl. i. 227.—*Q. muricata*, Roxb. Fl. Ind. iii. 635.—? *Q. neurophylla*, Miq. Fl. Ind. Bat. Suppl. 351; DC. Prod. xvi. ii. 107.

Java,—*Blume*, *Junghuhn;* Sumatra,—*Diepenhorst*, *Forbes* (Nos. 2933, 3144); Borneo,—*Beccari*, *P. B.* 3241, 3336; Perak,—*Scortechini* (without number); *King's Collector* (Nos. 1622, 2264, 2282, 3272, 3341, 3502, 3866, 3944, 4837, 4840, 4870, 4944, 5543, 6583, 7013, 7241, 7254, 7371); Penang,—*King's Collector*, 1627, 2274, at elevations of from 1,000 to 2,500 feet; Malacca,—Maingay (*Kew Distrib.*) 1530.

A spreading tree, 40 to 60 and even 100 feet in height. This approaches *Q. hystrix*, Korth., and *Q. cyrtorhyncha*, Miq., as has been pointed out under these species. It is rather variable as to form of leaf and amount of pubescence. Typical *Q. Sundaica*, as originally described by Blume, has thinner, more elliptic, leaves, with more tendency to become glabrous when adult than *Q. hystrix*. This species also resembles *Q. grandifrons*, King; but the latter has larger, more coriaceous, leaves, larger fruit, and is almost perfectly glabrous. Oudemann's remarks on the relations of Blume's three species—*pruinosa*, *Sundaica*, and *Korthalsii*—are excellent, and their perusal causes one to regret that their author did not pursue further his researches amongst the rich Malayan materials in the Leiden Herbarium. Roxburgh's description of *Q. muricata* in his *Flora Indica* is rather meagre; but his unpublished drawing of that species in the Calcutta Herbarium leaves no doubt as to its identity with Blume's earlier published *Q. Sundaica*. Several specimens named *Q. Sundaica* in the Leiden Museum are, in my opinion, referable to *Q. pallida*, Bl.

PLATE 47.—*Q. Sundaica*, Bl. 1, branch of typical *Q. Sundaica*, Bl., with inflorescence; 2, leaf of a form with leaves very obtuse at the base,—*all of natural size;* 3, male flowers and anthers: *enlarged.*

PLATE 48.—*Q. Sundaica*, Bl. 4 to 7, branches with fruit in various stages of maturity; 8 & 9, glans and cupule,—*all of natural size and all with leaves of the form named Q. Korthalsii by Blume.*

39. QUERCUS LAMPONGA, *Miq. Fl. Ind. Bat. Suppl.* 347.

Inflorescence and young parts minutely griseous, furfuraceous-pubescent. *Leaves* elliptic-lanceolate, rarely elongate-lanceolate, shortly and rather abruptly acuminate, entire; the base acute; both surfaces, but especially the midrib and 9 to 10 pairs of nerves, minutely pubescent or glabrous; the upper slightly shining; the lower pale and dull; length of blade 3·5 to 5·5 in., breadth 1·5 to 2 in.; petiole ·25 in. *Spikes*, male and androgynous, in terminal panicles much longer than the leaves; the androgynous spikes few. *Male flowers* solitary; the perianth 6-lobed; stamens about 12. *Cupules* solitary, crowded, nearly sessile, minutely sericeous; the bodies of the scales broad, connate; their acute apices alone free, when young hemispheric, when adult saucer-shaped; ·65 in. in diameter, embracing only the base of the glans. *Glans* ovoid-globose or hemispheric, apiculate; the base truncate, minutely tomentose, ·75 in. long and ·6 in. in diameter.—*DC. Prod.* xvi. ii. 95; *Miq. Ann. Mus. Lugd. Bat.* i. 109; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 229; *Hook. fil. Fl. Br. Ind.* v. 611.—*Q. brevi-petiolata*, Scheff. Observ. Phyt. ii. 47.

Bangka,—*Teysmann;* Borneo,—*Beccari* (*P. B.* 3012); New Guinea,—*Beccari* (*P. P.* 858); Perak,—*Scortechini* (1472); *King's Collector*—many numbers.

This is one of the species on the borders of *Pasania* and *Cyclobalanus;* for the scales, although not united by their edges so as to form lamellæ, are in verticels which resemble lamellæ; and between actual lamellæ with denticulate edges, and verticels of scales closely touching by their edges and with their apices manifestly free, it is indeed difficult to draw a line. Miquel, in his original description, did not indicate whether he considered this to be a *Pasania* or a *Cyclobalanus*. M. De Candolle puts it in the latter, but specimens in the Herbaria at Leiden, Kew, and Calcutta, named by Miquel's own hand, have the cupules more like those of a *Pasania*, and in leaves as well as fruit they exactly resemble Scheffer's type specimens of his *Q. brevi-petiolata*, which he referred to *Pasania*. On the other hand, specimens collected by myself from a tree in Singapore have cupules so lamellate that I for some time considered them to belong to *Q. Ewyckii*,—a *Cyclobalanus* which much resembles this species in leaves.

It is not at all clear to me that this species should not be merged in *Q. pseudo-Molucca*, Bl. The only authentic materials of the latter have indeed more coriaceous leaves and larger fruit; but the material is so poor that it is difficult to form an opinion upon the point. The distinction drawn by Hance (*Journ. Bot.* 1875, 365) between *Pasania* and *Cyclobalanus*, founded on the male flowers of the former being glomerulate and of the latter being solitary, breaks down here, for the male flowers of this are solitary.

PLATE 49.—*Q. Lamponga*, Miq. 1, branch with ripe acorns; 2, twig with young acorns,—*of natural size.*

40. QUERCUS DASYSTACHYA, *Miq. in Ann. Mus. Lugd. Bat.* i. 221.

Young shoots and rachis of spikes densely covered with minute tawny, stellate tomentum. *Leaves* coriaceous, ovate-elliptic, shortly acuminate, entire; the base acute; upper surface, when young, minutely hispid; when adult shining, sub-glabrous, except the midrib which is minutely tomentose; under surface densely covered with minute grey tomentum, mixed with scales and stiff short hairs, especially on the midrib and nerves;

main nerves 8 or 9 pairs, impressed on the upper, prominent on the lower, surface; length of blade 4·5 in. to 7 in., breadth 2 in. to 2·5 in.; petiole ·25 in., stout. *Spikes* erect, androgynous, in lax terminal panicles, slightly longer than the leaves. *Female flowers* pretty numerous near the base of the spikes. *Male perianth* 5-cleft; stamens 10. *Female flowers* solitary. *Cupule* sessile, campanulate when young, densely but minutely cinereous-tomentose, minutely tuberculate, embracing half the glans. *Glans* ovoid, much apiculate, glabrous, except the bases of the styles which are tomentose. Ripe cupule unknown.

Borneo, *De Vriese. Beccari* (without number).

When he described this species, Miquel had seen only the leaves and young spikes which are deposited in the Herbarium at Utrecht. Sig. Beccari's specimens have young fruit, and it is one of these which I have figured. The species evidently belongs to the *Pasania* group, in which its nearest allies appear to be *pruinosa*, Bl., and *hystrix*, Korth.

PLATE 45B.—*Q. dasystachya*, Miq. 1, branch with young spikes; 2, spikes of young fruit (*from Beccari's specimen*); 3, young cupule and glans,—*of natural size.*

41. QUERCUS HYSTRIX, *Korth. Verh. Nat. Gesch. Bot.* 201. *t.* 43.

Young parts densely covered with minute furfuraceous, fulvous, stellate tomentum. *Leaves* coriaceous, ovate-oblong or elliptic-oblong, acute or shortly cuspidate, entire; the base acute; upper surface, even when adult, furfuraceous-pubescent; the midrib and nerves minutely tomentose; under surface pale, more or less densely furfuraceous-puberulous, except the midrib and 12 to 14 pairs of bold nerves which are fulvous (often stellately) tomentose; secondary nerves transverse, distinct; length of blade 3·5 to 5 in., breadth 1·65 to 2·25 in.; petiole ·25 in. *Flower spikes* shorter than the leaves; those bearing females solitary and axillary; the males in small, contracted, terminal panicles; both densely tomentose when young. *Male flowers* solitary or in fascicles, with lanceolate bracteoles; the perianth 6-cleft. *Spikes of ripe fruit* longer than the leaves, axillary; fruit solitary, rarely with 1 or 2 abortive at the base. *Cupule* sub-sessile, infundibuliform when young, finally becoming saucer-shaped; the scales ovate, with long spiny points, tomentose; in the younger states united only by their bases, leaving the long verticellate, spine-like, curved, apices free. *Mature cupule* on a thick short stalk, saucer-shaped, flat, embracing only the base of the glans; ·75 in. in diameter and only ·1 in. deep; the bases of the scales broad and entirely connate; the apices free, spreading, or reflexed. *Glans* hemispheric, conic, crowned by the remains of the united styles; the base truncate, glabrous when ripe; length, including the remains of the styles, about ·5 in.—*Wenzig in Jahrb. Bot. Gart. Berl.* iv. 223; *Hook. fil. Fl. Br. Ind.* v. 611.—*Q. Korthalsii*, Bl., vars. *kajan* and *hystrix*, Bl. in Mus. Lugd. Bat. i. 293; DC. in Prod. xvi. ii. 90; Oudem. Annot. Cup. Jav. 11.—*? Q. pruinosa*, Bl., var. B. Fl. Jav. Cupul. 10.—*Castanea ? furfurella*, Miq. Fl. Ind. Bat. Suppl. 352; Ann. Mus. Lugd. Bat. i. 108.

Sumatra,—*Korthals and others;* Singapore,—*King's Collector* (1253); Malacca,—*Maingay;* (*Kew Distrib.*) 1458; Perak,—*King's Collector* (Nos. 7895 and 10636).

This is a considerable tree, attaining a height of 40 to 80 feet. It is allied to *Q. Sundaica*, Bl., and to *Q. pruinosa*, Bl. From the former it is distinguished by its greater amount of furfuraceous pubescence and more oblong leaves which are narrower at the base, and by its more contracted inflorescence, smaller fruit with more echinate cupules which, until half ripe, are infundibuliform. To *Q. pruinosa*, Bl., this is allied by its inflorescence; but this is less furfuraceous and has smaller fruit. The leaves of *pruinosa* are, moreover, more oval, and have much broader bases, than the leaves of this. Blume's variety *pachyphylla* (of his *Q. Korthalsii*), *Mus. Lugd. Bat.* i. 292, is represented in his herbarium at Leiden by only a few leaf specimens accompanied by loose cupules. The latter in my opinion probably belong to *Q. pruinosa*, Bl., as also may some of the leaves. But the material is insufficient to form an opinion upon. *Q. Korthalsii*, Bl., var. *kajan*, is in my opinion referable to the present species rather than to *Q. Sundaica* as Blume understood it. No fruiting specimen of var. *kajan*, Bl., has come under my observation. De Candolle considers Zollinger's specimen No. 2264 to be *kajan*, but the acorns accompanying that are about 1·5 in. in diam.

PLATE 50.—*Q. hystrix*, Korth. 1, branch with inflorescence; 2 & 3, young female spikes; 4, branch with young fruit; 5, mature glans,—*all of natural size.*

42. QUERCUS INDUTA, *Bl. in Batav. Verh.* 9, 220.

Young branches, leaves, inflorescence and ripe cupules more or less minutely lepidote-tomentose. *Leaves* thinly coriaceous, elliptic-oblong, entire, acute or shortly and bluntly cuspidate; the base much acuminate, slightly decurrent on the petiole; both surfaces pale. glaucescent; nerves 9 to 11 pairs, rather prominent below; length of blade 5 to 7 in., breadth 2·75 in. to 3 in.; petiole ·6 in. *Spikes* androgynous, axillary and solitary, or on short lax axillary or terminal panicles, shorter than the leaves. *Male flowers* sub-glomerulate; the perianth 6-cleft; stamens 12. *Female flowers* few; *cupules* sessile, ovoid, globular, when very young enveloping the whole of the glans except the styles, tubercular below, scaly towards the mouth. *Ripe cupules* hemispheric, enveloping only half the glans; the lower part with undulate, irregular lamellæ; the upper part near the erose mouth squamose, the bodies of the bracts being connate and only their glabrous apices free; diameter 1·25 in. to 1·5 in.; depth from ·5 in. to ·75 in. *Glans* depressed, hemispheric, apiculate, minutely tomentose, 1 in. to 1·25 in. in diameter and ·6 in. to 1 in. long.—*Bl. Bijdr.* 522; *Fl. Jav. Cupul.* 23. *t.* 12; *Mus. Lugd. Bat.* i. 294; *DC. Prod.* xiv. ii. 96. *Miq. Pl. Jungh.* i. 9; *Fl. Ind. Bat.* i, 854; *Ann. Mus. Lugd. Bat.* i. 113; *Oudem. Annot. Cupul. Jav.* 12. *t.* 7; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 228.

Western Java,—*Teysmann, Van Gorkum.*

The cupules, which are at first ovoid-globular with entire mouths, become pyriform as they grow (from the development of the glans). When ripe they are nearly hemispheric, irregularly erose at the mouth, and sometimes slightly constricted at the base into a short, thick peduncle. In M. De Candolle's herbarium there are put with typical *induta* some specimens without fruit of a form with longer, narrower, and more fulvous leaves; similar specimens occur also in the collection at Leiden. These may possibly belong to a variety. But the var. B. described by Blume (*Mus. Lugd. Bat.* l.c.) as having a smaller ovoid-globose glans is, as M. De Candolle remarks, simply the young state of typical *induta.* M. De Candolle, by a slip, describes the young shoots and upper surfaces of the leaves of *induta* as glabrous, whereas they are conspicuously lepidote-tomentose.

PLATE 51.—*Q. induta*, Bl. 1, branch with nearly ripe acorns; 2, branch with young acorns; 3, male spike; 4 & 5, fully ripe acorn,—*all of natural size.*

43. Quercus Curtisii, *King; Hook. Fl. Br. Ind.* v. 612.

Glabrous, except the inflorescence. *Leaves* coriaceous, oblong-lanceolate to ovate-lanceolate, acuminate; the base acute; the edges slightly recurved (when dry); both surfaces glabrous: the upper shining, the lower pale, dull, and sometimes glaucescent; nerves about 10 pairs, distant, bold (as is the midrib) below, obsolete above; length of blade 6 to 9 in., breadth 2 to 2·5 in.; petiole ·3 to ·5 in., stout. *Spikes* rather numerous, in few-bunched terminal panicles or 1—2 in the axils of the leaves, a few bearing female flowers. *Male flowers* in rather sparse glomeruli, or solitary; the perianth with 5 or 6 blunt lobes; stamens 12, globular. *Female flowers* solitary; *ripe acorns* crowded, touching, but not connate. *Cupule* sessile, woody, discoid, wavy, about ·7 in. in diameter; pubescent externally and minutely sub-tubercular, the bodies of the scales being closely connate, imbricate, only their rather thick apices being free. *Glans* turbinate when young, cylindric when old, with a conical apex crowned by the remains of the united styles, pubescent; ·5 in. to ·7 in. in diameter and ·8 in. high (to the very apex).

Penang, near the waterfall,—*King;* Perak,—*King's Collector* (No. 3304).

A tree 20 to 25 feet in height; apparently not common, as it does not occur in Scortechini's Perak collection at all, and once only in each of the other collections mentioned above.

Plate 52.—*Quercus Curtisii,* King. 1, branch with spikes bearing male and female flowers; 2 spikes with young acorns; 3, with young acorns; 4, young cupule seen from below; 7, mature fruit,—*all of natural size;* 6, male flowers: *enlarged.*

44. Quercus pruinosa, *Bl. in Batav. Verh.* ix. 217.

The whole of the young parts covered with rufous, stellate, furfuraceous tomentum, part of which is more or less quickly deciduous. *Leaves* coriaceous, ovate to ovate-oblong, acute or acuminate, entire; the base broad and rounded; adult leaves more or less glabrous on the upper, and scurfy-pubescent on the lower surface, except the midrib and 10 to 12 pairs of main nerves, which remain fulvous-tomentose; length of blade 4 to 6 in., breadth 1·65 to 2·5 in.; petiole under ·5 in.; stipules rather prominent in the young shoots, ovate-lanceolate, velvetty; nearly ·5 in. long, caducous. *Spikes* fulvous-tomentose, solitary or in small fascicles, terminal or axillary, shorter than the leaves. *Male flowers* in fascicles of 3, bracteolate; the perianth 6-cleft; the lobes broad, sub-erect; anthers 10 to 12. *Ripe fruit* solitary, rarely in pairs; the *cupule* woody, saucer-shaped, 1 in. to 1·25 in. broad and ·25 in. deep, embracing only the base of the glans; its scales broadly ovate with thick blunt apices, pubescent, closely adpressed and connate. *Glans* much depressed, globose; the apex umbonate, and crowned by the united bases of the styles, smooth when ripe.—*Bijdr.* 521; *Fl. Jav. Cupul.* 9. *t.* 1; *Mus. Bot.* i. 292; *Miq. Pl. Jungh.* i. 10; *Fl. Ind. Bat.* i. 850, *in Ann. Mus. Lugd. Bat.* i. 107; *DC. Prod.* xvi. ii. 87; *Oudem. Annot. Cup. Jav.* 11.—*Q. pseudo Molucca,* Bl. var. *pruinosa,* Wenzig in Jahrb. Bot. Gart. Berl. iv. 227.

Java,—*Blume, Zollinger.*

Except Zollinger, nobody since Blume's time appears to have collected the exact plant which the latter described under this name (*pruinosa*), and I have seen specimens of it nowhere except in the collections at Leiden and Calcutta, and in that of M. De Candolle at Geneva (in which there is a specimen received from Leiden). It is a very distinct looking species, and it can only be from not having seen specimens of it that so many botanists have confused it with *Q. pseudo-Molucca*, *Q. Korthalsii*, &c. The young cupules in this, as in most *Pasanias*, have their scales distinct while young. Forbes' specimens from Western Java (Nos. 807 and 940) may belong to *Q. pruinosa*, Bl., as Dr. Wenzig suggests. The specimens have young flower-spikes, but are without ripe fruit. They are much less hairy and less pruinose than Blume's type specimen at Leiden.

PLATE 53B.—*Q. pruinosa*, Bl. 1, branch with young male spikes; 2, spike of young fruit; 3, half-ripe fruit; 4, nearly mature cupule; 5, nearly mature glans; 6, ripe fruit,—*all of natural size. No.* 6 *is copied from Blume's figure.*

45. QUERCUS PALLIDA, *Bl. Bijdr.* 524.

Young shoots puberulous. *Leaves* coriaceous, elliptic-oblong or lanceolate, acuminate, entire; the base acute or acuminate; main nerves 10 to 12 pairs, prominent on the lower surface (as are the secondary nerves) from their dark colour and dark deciduous pubesence; the rest of the lower surface uniformly covered with minute pale pubescence; upper surface glabrous; length of blade 4 to 6 in., breadth 1·5 in. to 2 in.; petiole about ·5 in. long. *Inflorescence* terminal, tawny, pubescent; the spikes panicled, at least one of them bearing female flowers; bracteoles of male flowers single, linear. *Female spike*, when mature, stout, erect, 6 to 8 in. long, pubescent; fruits solitary; the *cupule* sessile, flat, saucer-shaped, woody, ·35 in. deep and 2 in. in diameter; tubercular-echinate externally, the bases of its scales being connate, and their apices free so as to form broad hard tubercles. *Glans* depressed-turbinate, with a few shallow vertical grooves, slightly depressed round the short remains of the conjoined styles; when ripe smooth, ·75 in. high and nearly 2 in. in diameter.—*Blume Fl. Jav. Cup.* 12. *t.* 4, 5; *Mus. Bot. Lugd. Bat.* i. 293; *DC. Prod.* xvi. ii. 84 and *Wenzig in Jahrb. Bot. Gart. Berl.* (excl. syn. *Q. pseudo-Molucca, Bl., var. pallida, Miq., and* var. *rostrata, Bl.*); *Oudem. Annot. Cup. Jav.* 11. *t.* vi; *Miq. in Fl. Ind. Bat.* i. 851.—*Q. pseudo-Molucca*, Miq., (non Bl.) var. *pallida;* Miq. in Ann. Mus. Lugd. Bat. i. 108.

Java,—*Blume, Kurz*, Sumatra,—*H. O. Forbes*, at elevations of from 3,000 to 6,000 feet; *fruit only:* No. 1143*a*, leaves only.

This is described by Mr. Forbes, who collected it on Mount Dempe in Western Sumatra, as a very large tree. He was unable to obtain the leaves and fruits from the same tree. This species is very badly represented in collections, the type in Leiden being but a poor specimen. When Blume figured the species he had never seen ripe fruit. Oudeman's figure of the very characteristic ripe fruit is excellent.

PLATE 53A.—*Q. pallida, Bl.* 1, branch with inflorescence; 2 & 3, young fruits; 4, ripe fruit; 5, cupule,—*all of natural size;* 6, male spike: *enlarged.*

SECTION IV.–CYCLOBALANUS.

Cyclobalanus.—*Male spikes erect; styles and leaves as in* PASANIA; *involucres cupulate, solitary or in threes, their bracts connate into entire or denticulate lamellæ as in* CYCLOBALANOPSIS; *leaves entire.*

Glans ovoid (obovoid in Q. Thomsoni), conspicuously longer than broad.

Leaves glabrous.

  Leaves oblong-lanceolate; glans an inch or more long . . . . 46. *Q. daphnoidea.*
  Leaves ovate to ovate-oblong, glaucous beneath; glans ·75 in. long (*? Cyclobalanopsis*) . . . . 47. *Q. eumorpha.*

Leaves not glabrous.

  Leaves obovate, minutely tomentose beneath; glans glabrous (*see under Pasania*) . . . . 20. *Q. Lindleyana.*
  Leaves ovate-elliptic, minutely puberulous beneath; glans pubescent . 59. *Q. Ewyckii* var. *latifolia.*

  Leaves more or less lanceolate; both surfaces minutely stellate, tomentose; glans minutely sericeous or glabrous . . . . 48. *Q. conocarpa.*
Leaves glabrescent; glans obovoid . . . . 67. *Q. Thomsoni.*

Glans hemispheric, not conspicuously longer than broad.

Cupule covering half the glans or more.

  Leaves with short thick petioles.

    Leaves elliptic-oblong; cupule with denticulate lamellæ, sessile . . 49. *Q. Bancana.*
    Leaves lanceolate, cupule with entire lamellæ, pedunculate . . . 50. *Q. Reinwardtii.*

  Leaves with long slender petioles.

    Leaves lanceolate, cupules sessile . . . . 51. *Q. sericea.*

Cupule covering less than half the glans.

  Lamellæ of cupule more or less denticulate.

    Leaves from elliptic to oblong-lanceolate; female flowers always solitary . . . . 52. *Q. Bennettii.*
    Leaves oblanceolate to oblong-lanceolate; female flowers in threes, rarely solitary . . . . 53. *Q. Cantleyana.*

Lamellæ of cupule not denticulate.
Leaves quite glabrous at all ages.
Leaves broadly lanceolate; glans ·75 in. in diameter . . . . 54. *Q. Wenzigiana.*
Leaves narrowly lanceolate; glans ·5 to ·6 in. in diameter . 55. *Q. Rassa.*

Leaves glabrous, or nearly so, when adult.
Leaves elliptic, acute, sub-coriaceous . . . . 56. *Q. cyrtorhyncha.*
,, elliptic, coriaceous . . . . 57. *Q. Diepenhorstii.*
,, broadly elliptic or oval, abruptly and bluntly cuspidate 58. *Q. Rajah.*
,, oblanceolate, obtuse, coriaceous, 5 to 7 in. long . . . 61. *Q. lucida.*
,, lanceolate or oblanceolate, obtuse, sub-coriaceous, 2 to 4 in. long . . . . 62. *Q. omalkos.*

Leaves pubescent beneath when adult.
Leaves lanceolate or oblong-lanceolate; under surfaces silvery grey and adpressed pubescent . . . . 59. *Q. Ewyckii.*
Leaves oblong-lanceolate, minutely hairy and glaucous beneath; glans 1·2 in. to 1·4 in. in diameter . . . . 64. *Q. Teysmannii.*

Glans turbinate or depressed hemispheric, conspicuously broader than long.
Lamellæ of cupule thick and sausage-like.
Glans not more than an inch in diameter.
Leaves acuminate . . . . 60. *Q. Clementiana.*

Leaves obtuse.
Coriaceous, nervation indistinct, 5 to 7 in. long . . . . . . 61. *Q. lucida.*
Sub-coriaceous, venation distinct, 2 to 4 in. long . . . . . 62. *Q. omalkos.*

Glans more than an inch in diameter.
Leaves elliptic . . . . 63. *Q. platycarpa*

Leaves oblong-lanceolate.
Stipules persistent . . . . 64. *Q. Teysmannii.*
Stipules not persistent . . . . 65. *Q. cyclophora.*

Lamellæ of cupule thin.
Cupule much wider than the glans . . . . 66. *Q. Eichleri.*
Cupule closely adherent to glans . . . . 67. *Q. Thomsoni.*

46. QUERCUS DAPHNOIDEA, *Bl. Fl. Jav. Cupulif.* 28. *t.* 16.

Glabrous, except the cupules which are minutely rufous-pubescent. *Leaves* small, thinly coriaceous, oblong-lanceolate, shortly and bluntly cuspidate, entire; the base acute; upper surface shining; lower dull, slightly paler; nerves 8 to 10 pairs, thin but prominent beneath; length of blade 3 to 5 in., breadth 1·3 in. to 1·7 in.; petiole ·35 in. *Mature female spikes* stout, longer than the leaves. *Cupules* solitary, on short thick pedicels, campanulate, shallow, embracing only the lower fifth of the glans; lamellæ 7 or 8, broad, sericeous, minutely denticulate or entire; about 1 in. in diameter and ·4 in.

deep. *Glans* smooth, shining, ovoid-conic, apiculate; the base truncate; 1·1 in. long and ·7 in. in diameter.—*Miq. Fl. Ind. Bat.* i. 862; *Ann. Mus. Lugd. Bat.* i. 110; *DC. Prod.* xvi. ii. 96; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 235.

Western Java in province Bantam,—*Van Hasselt;* Eastern Sumatra,—*H. O. Forbes* (1499 *and* 1668*A*).

In foliage this approaches some of the narrow-leaved forms of *Q. pseudo-Molucca*, but the texture in this is much thinner. The cupules of the two are not unlike in size and shape; but in this they are deeper, and the bracts are distinctly zonate. Dr. Wenzig quotes Forbes's Sumatra specimens above noted under *Q. pseudo-Molucca*, and omits *Q. daphnoidea* from his enumeration of the oaks of South-Eastern Asia.

PLATE 54A.—*Q. daphnoidea*, Bl. Fruiting-branch: *of natural size.*

47. QUERCUS EUMORPHA, *Kurz For. Fl. Burm.* ii. 487.

Young branches pubescent; all other parts glabrous, except the cupule which is rufous-pubescent externally. *Leaves* coriaceous, ovate to ovate-oblong, shortly and bluntly acuminate, entire; the base slightly narrowed to the petiole and slightly unequal; both surfaces smooth, the lower glaucous when young; main nerves about 6 pairs, prominent beneath; length of blade 3 to 4 in., breadth 1·75 in.; petiole about ·5 in., rather slender. *Cupules* woody, sub-sessile, campanulate when young, sub-hemispheric when adult, narrowed to the base, ·7 in. in diameter and ·4 in. deep, embracing only about the lower third of the *glans;* the scales in concentric zones, when young fulvous-tomentose externally, when adult quite connate; the zones about 5, unequally toothed, narrow, unequal in width and pubescent. *Glans* ovoid-conic, crowned by the remains of the united styles, glabrous, the base truncate, ·75 in. long.—*Hook. fil. Fl. Br. Ind.* v. 612.

Burmah; Nattong in Martaban,—*Kurz;* Moolyet,—*Gallatly;* at elevations of from 6,000 to 7,000 feet.

A scraggy evergreen tree from 15 to 30 feet high. Kurz puts this with *Pasania*, but the scales of the cupule are in zones from a very early stage, and it must clearly belong either to *Cyclobalanopsis* or *Cyclobalanus*, but to which it is impossible to decide until male inflorescences shall be found. This approaches *Q. Harlandi*, Hance, the leaves of which, however, have much longer petioles: moreover, the cupules of the two differ.

PLATE 54B.—*Q. eumorpha*, Kurz. 1, branch with fruit not quite ripe; 2, branch with ripe fruit; 3, glans; 4, ovate-oblong leaves from another specimen,—*all of natural size.*

48. QUERCUS CONOCARPA, *Oudem. in Versl. en Mededeel*, xii. 206; *Annot. Crit. Cup. Javan.* 18. *t.* 10.

Young branches and young leaves densely covered with minute, rufous, deciduous, stellate tomentum. *Leaves* coriaceous, narrowly elliptic-lanceolate or oblong-lanceolate, obtusely cuspidate, entire; the base acute; upper surface sub-glabrous when adult, except the midrib and nerves which on both surfaces remain stellate-tomentose; lower surface, between the 9 to 12 pairs of bold curving coloured nerves, covered with minutely adpressed stellate pale tomentum; length of blade 3 to 4 in., breadth 1·3 in.

to 1·6 in.; petiole ·2 in. to ·3 in. *Male spikes* shorter than the leaves, solitary and axillary, or in lax terminal panicles. *Female spikes* few, below the males, axillary, solitary; when mature nearly twice as long as the leaves. *Cupules* sessile, solitary when young, globular, and embracing the whole of the *glans* except its apex, the lamellæ much denticulate; when ripe ·7 in. in diameter and ·2 in. deep, saucer-shaped, the 5 or 6 lamellæ obscurely and irregularly denticulate, pubescent, covering only the base of the glans. *Glans* ovoid with truncate base; the apex produced into a long conical point, crowned by the column of persistent styles, sericeous or glabrous; length to apex ·75 in., diameter ·6 in.—*Miq. in Ann. Mus. Lugd. Bat.* i. 113; *DC. Prod.* xvi. ii. 93; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 230; *Hook. fil. Fl. Br. Ind.* v. 612.

Mount Malawar in Western Java,—*Junghuhn;* Borneo,—*Beccari* (*P.B. Nos.* 12, 1207, *and* 1710); Sumatra,—*Beccari* (*P.S.* 74); Perak,—*Scortechini* (*King's Collector, Nos.* 821, 5816, 5846, *and* 10519); Singapore,—*King's Collector* (*No.* 1249).

The specimens of this in the Leiden Herbarium, on which Oudemanns founded this species, are very fragmentary indeed. It is represented in M. De Candolle's herbarium by a few fruits, and is (1887) quite unrepresented at Kew and the British Museum. In Perak the tree appears to be tolerably common; and the Perak specimens differ in no respect from the Javanese, except in having the glans quite glabrous when ripe.

PLATE 56A.—*Q. conocarpa*, Oudem. 1, branch with male inflorescence; 2, branch with female inflorescence; 3, ripe acorns (*from Perak specimens*); 4, ripe acorn (*from a Java specimen*),—*all of natural size.*

49. QUERCUS BANCANA, *Scheff. Observat. Phytog.* ii. 49; iii. 94 (*not of Kurz Fl. Brit. Burm.* ii. 485).

Young branches minutely puberulous. *Leaves* coriaceous, elliptic-oblong, shortly and rather abruptly acuminate, entire; the base acute; when young both surfaces minutely puberulous-lepidote; when adult almost glabrous; the upper surface dull; the lower pale and slightly shining; midrib and about 9 pairs of nerves bold and faintly coloured on the lower surface; length of blade 6 to 8 in., breadth 2·25 in. to 3 in., petiole ·6 in. to ·75 in. *Fruiting spikes* stout, shorter than the leaves. *Cupule* solitary, on a stout short pedicel, campanulate-hemispheric, embracing more than half the glans, with 5 to 7 irregular, minutely denticulate, rather obscure, laminæ; the lip slightly recurved, sericeous, ·4 in. to ·6 in. deep and 1 in. in diameter. *Glans* hemispheric when young; when adult depressed-globose, shortly apiculate; the base truncate, puberulous-lepidote, ·8 in. long and 1 in. in diameter.

Island of Bangka,—*Teysmann.*

According to the technical characters founded on the cupule this is a *Cyclobalanus*, but its real affinities are with *Q. Amherstiana*, *Falconeri* and *scyphigera*, which are *Pasanias*. The late Dr. Scheffer, the author of this species, explains (l.c. iii. 94) that when he first described it he associated with its leaves the flower and fruit of a different species which had by mistake been fastened on to the same sheet. On the subsequent receipt of specimens bearing leaves and fruit he re-described the species. The specimens from which I have written the foregoing description bear the number 11443 of the *Herb. Hort. Bot. Bogor.* According to Dr. Scheffer, the ripe fruit often measures 1·5 in. in diameter, but I have seen none measuring more than 1 in.

Plate 56 B.—*Q. bancana*, Scheff. 4, leaf; 5, spike with ripe acorns; 6 cupule, *seen from above;* 7, glans, *side view,—all of natural size.*

50. Quercus Reinwardtii, *Korth. in Verh. Nat. Gesch. Bot.* 211.

Young parts minutely lepidote-canescent. *Leaves* coriaceous, oblong-lanceolate, bluntly acuminate, entire; the base acuminate; upper surface glabrous shining, the nerves obscure, the midrib distinct; under surface paler, dull, minutely canescent, the midrib thick and prominent; main nerves 7 to 10 pairs, sub-glabrous, and dark-coloured, as are the secondary and minor nerves; length of blade 3·5 in. to 5 in., breadth 1·4 in. to 1·8 in.; petiole ·25 in. to ·4 in. *Male spikes* shorter than the leaves, solitary, axillary, pubescent; the flowers interruptedly glomerulate. *Female spikes* longer than the leaves, terminal or axillary. *Cupules* minutely sericeous, solitary, on long stout peduncles; when young sub-globular, enveloping the whole of the young glans except its apex; when adult shallow, campanulate (or even saucer-shaped when very old), narrowing at the base into the thick annulated peduncle; lamellæ about 7, the lowest the broadest; their edges entire (the scales being completely united), 1 in. in diameter and ·25 in. deep. *Glans* hemispheric, apiculate, minutely but deciduously pubescent; (immature) ·9 in. in diameter and ·5 in. long.—*Blume Mus. Lugd. Bat.* i. 300; *Miq. Fl. Ind. Bat.* i. 1, 859; *Ann. Mus. Lugd. Bat.* i. 112.; *DC. Prod.* xvi. ii. 92; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 234.

Sumatra—*Korthals* (312); Borneo,—*Teysmann* (*Herb. Hort. Bot. Bogor.* 11301 and 11302).

Of this species there are very few examples in collections. The leaves of Korthals' and Miquel's specimens in the collections at Leiden and Utrecht have from 10 to 12 pairs of nerves, while Teysmann's Bornean specimens have only 7 to 8 pairs. Moreover, the secondary nerves of the Sumatra specimens are nearly as large and distinct as the primary nerves; and the reticulations are also prominent, which is not the case in the Bornean plants. Nevertheless, I think the two sets are referable to one species. Korthals' specimens have no ripe fruit, and the fruit of Teysmann's appears to be scarcely ripe. But, as far as the materials go, the two sets agree in fruit.

Plate 57A.—*Q. Reinwardtii*, Korth. 1, branch with male spikes; 2, young female spike (*from Korthals' Sumatra specimen, No.* 312); 3, spike of nearly ripe fruit; 4, glans (*from Teysmann's Bornean specimen*): *all of natural size.*

51. Quercus sericea, *Scheff. Observ. Phytol.* ii. 49.

Young branches minutely puberulous, sparsely lenticellate. *Leaves* on rather long slender petioles, coriaceous, narrowly elliptic-lanceolate (sometimes oblique), acuminate, entire; the base acute or acuminate (sometimes unequal); the upper surface shining; the lower paler and less shining, both glabrous; nerves 8 to 10 pairs and, like the midrib, prominent below; length of blade 3·5 in. to 6 in., breadth 1·2 in. to 1·8 in.; petiole ·4 in. to ·7 in. *Acorns* in short axillary spikes, sessile, solitary. *Cupules* (young) sub-turbinate, with 5 or 6 denticulate zones, sericeous. *Glans* ovoid-globose; the apex depressed and abruptly apiculate, densely sericeous.

Bangka,—*Teysmann;* Borneo,—*Beccari* (*P. B.* 2919).

I have seen several specimens of this which had been named by Dr. Scheffer himself, but all of them were without ripe fruit. The cupule is described by Dr. Scheffer as being

9 to 10-zonate, 5 lines broad and 7 lines long, and the glans as sub-ovate, globose or sub-globose, measuring without the styles 6 lines in length and 6 or 7 lines in breadth. But I doubt whether even the author's specimens were fully ripe.

PLATE 57B.—*Q. sericea*, Scheff. 5, branch with female spikes; 6, branch with young acorns; 7, acorns further advanced,—*all of natural size;* 8 and 9, female flowers : *enlarged.*

52. QUERCUS BENNETTII, *Miq. Fl. Ind. Bat.* i. 857; *Suppl.* 348.

Young shoots nearly glabrous. *Leaves* coriaceous, from elliptic-oblong to oblong-lanceolate, shortly, bluntly and rather abruptly cuspidate, entire; gradually narrowed from the lower fourth into the slender ·35 in. long petiole; both surfaces at first minutely pubescent, but glabrous when old; nerves 6 to 10 pairs; length of blade 3 to 4·5 in., breadth 1·25 to 2 in. *Inflorescence* slender, panicled, terminal, longer than the leaves. *Male flowers* solitary; perianth 6-lobed; stamens about 12. Spikes of *female flowers* solitary, axillary; flowers solitary. *Cupules* on short, thick pedicels, solitary, patelliform, and covering only the base of the glans, puberulous; zones about 6, sub-denticulate, ·6 in. to ·75 in. in diameter *Glans* smooth, ovoid-globose, with conical apex and truncate base, ·5 in. to ·6 in. long and ·6 in. to ·7 in. in diameter.—*Miq. Ann. Mus. Lugd. Bat.* i. 112; *Hook. fil. Fl. Br. Ind.* v. 612; *DC. Prod.* xvi. ii. 94; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 235.—*Q. Miqueliana*, Scheff. Observ. Phytog. ii. 48, iii. 94.

Malacca,—*Maingay* (No. 1460); Borneo,—*Beccari* (*P.B.* 2266, 2514); Bangka,—*Teysmann*, *Kurz.*

This resembles *Q. Lamponga*, Miq., in leaves; but the acorns of *Q. Lamponga*, although but slightly muricate, are those of a *Pasania.*

PLATE 58A.—*Q. Bennettii*, Miq. 1, branch with male inflorescence; 2, spikes of female flowers; 3, ripe acorn; 4, glans,—*all of natural size.*

53. QUERCUS CANTLEYANA, *King in Hook. fil. Fl. Br. Ind.* v. 613.

Young shoots rather thick, angular, minutely lepidote-puberulous or sub-glabrous. *Leaves* coriaceous, oblong-lanceolate or oblanceolate, shortly and rather abruptly cuspidate, entire; the base acuminate; upper surface very minutely lepidote-puberulous or glabrous; the lower paler and minutely but densely lepidote-puberulous; main nerves 12 to 14 pairs and bold and prominent on the lower surface, as is the midrib; length of blade 5·5 to 7·5 in., breadth 2 to 3 in.; petiole ·5 in. to ·75 in. *Male spikes* solitary, axillary, longer than the leaves; flowers solitary, or sub-glomerulate; the perianth 6-lobed; stamens 12, rudimentary; ovary globular, pubescent. *Female spikes* (apparently on a different tree from the male) solitary, axillary, longer than the leaves, stout. *Cupules* in groups of 3 or 2, or occasionally solitary, on stout minutely bracteolate pedicels, ·3 to ·4 in. long; hemispheric and tubercular when young; adult cupules with 5 to 7 obscurely denticulate wavy pubescent lamellæ; sub-hemispheric, saucer-shaped; ·6 in. to ·7 in. in diameter and ·15 in. to ·3 in. deep; the pedicel thick, annular, and bearing one or two aborted fruits. *Glans* from depressed-hemispheric to conic-hemispheric, apiculate; the base truncate, deciduously adpressed, sericeous; ·75 in. in diameter and ·5 in. long.

Singapore,—*Lobb*, *Cantley* (No. 149); Perak,—*King's Collector* (5121, 5396, 5475, 5554, 5623, 5814, 7274).

A tree 60 to 100 feet high with a wide-spreading crown; very common in Perak. There are in the Buitenzorg Herbarium leaf specimens from the island of Riou which are probably referable to this very distinct and handsome species. This is allied to *Q. Ewyckii*, but is readily distinguishable by the long stalks of the usually agglomerate young cupules. It is not improbable that this may be the *Q. glomerata* of Roxburgh. But Roxburgh's description (*Fl. Ind.* iii. 460) is too meagre for identification, and he left no drawing of his plant at Calcutta.

PLATE 59.—*Q. Cantleyana*, King. 1, leaf with axillary male flower-spike; 2, young female flower-spike with the flowers solitary; 3 & 4, further advanced female spikes with the flowers agglomerate; 5, spike of mature fruit; 6 & 7, glans; and 8, cupule,—*all of natural size.*

54. QUERCUS WENZIGIANA, *King in Hook. fil. Fl. Br. Ind.* v. 613.

Glabrous, except the inflorescence which is minutely cinereous-puberulous. *Leaves* thinly coriaceous, oblong-lanceolate, rather abruptly and obtusely caudate-acuminate, entire; the base acute; upper surface shining; the lower dull, glaucescent; main nerves indistinct, 10 to 16 pairs; length of blade 3 to 5 in., breadth 1·5 to 1·75 in.; petiole ·3 to ·4 in. *Male spikes* longer than the leaves, solitary and axillary; or in lax spreading, terminal, leafless panicles; flowers solitary or sub-glomerulate; the perianth with 6 broad lobes; stamens 12; rudimentary ovary large, sericeous. *Female spikes* few, solitary, axillary. *Ripe cupules* sub-sessile, saucer-shaped, embracing only the base of the glans, ·6 in. to ·8 in. in diameter and ·15 to ·25 in. deep; lamellæ 5 or 6, bold, thick, sericeous, their edges entire. *Glans* depressed-globose; the apex conical; the base broad and truncate, smooth, shining, ·5 in. to ·7 in. long and ·75 in. in diameter.

Malacca,—*Griffith* (4482); *Maingay* (*Kew Distrib.* 1527); Penang,—*Curtis* (360); Perak,—*King's Collector*, 5584 (wrongly issued as *Q. lucida* Roxb.), 5955; Borneo,—Beccari (1208, 3263).

This species is allied to *Q. Rassa*, Miq., and especially to its var. *latifolia*. But this is distinguished by its larger, broader, less coriaceous leaves and much larger fruit. Along with his leaf specimens of this, Maingay distributed two kinds of loose acorns,—one really belonging to this species, and others belonging to *Q. Wallichiana*, Lindl. In his paper on Oaks (*Jahrb. Bot. Gart. Berl.* iv. 231), Dr. Wenzig describes Maingay's specimen No. 1527 as *Q. Diepenhorstii*, Miq. But having compared Maingay's plant with the fragment in the Utrecht Herbarium on which Miquel founded his *Q. Diepenhorstii*, I am satisfied that the two are totally distinct, and I take the opportunity of dedicating Dr. Maingay's plant to Dr. Wenzig. Dr. Hance placed this in his herbarium as *Q. Ewyckii*, Korth., which it is certainly not. The leaves of this are like those of *A. costata*, Bl., but the acorns of these two are totally unlike. This also resembles *Q. Clementiana*, mihi, a species collected by Maingay in Malacca (*Kew Distrib.* 1529); but this has smaller leaves, longer spikes, and different acorns.

PLATE 58B.—*Q. Wenzigiana* King. 5, branch with inflorescence (*from a Perak specimen*); 6, branch with ripe fruit (*from Beccari's Bornean specimen, Herb. Becc.*, 3263); 7 glans; 8, cupule,—*all of natural size;* 9, male flowers: *enlarged.*

55. QUERCUS RASSA, *Miq. Fl. Ind. Bat. Suppl.* 350.

The youngest branches and the rachises of the flower-spikes minutely griseous-tomentose; all the other parts quite glabrous. *Leaves* small, rigidly coriaceous, from narrowly lanceolate to elliptic-lanceolate, rather bluntly acuminate; edges entire and slightly recurved when dry; the base acuminate, rarely acute; both surfaces quite smooth: the upper shining, the lower dull and pale; nerves 8 to 14 pairs, anastomosing inside the margin, very indistinct; length of blade 2·5 in. to 3·5 in., breadth ·75 in. to 1·35 in. (in var. *latifolia* 1·6 in.); petiole ·25 in. to ·6 in. *Spikes* slender, axillary, or in sparse terminal panicles, the female lowermost. *Male flowers* sub-glomerulate or solitary; the perianth with 6 blunt teeth; stamens 12; rudimentary ovary large, globose, villous. *Mature female spikes* slightly longer than the leaves; the flowers sessile, solitary. *Ripe cupules* saucer-shaped, embracing only the base of the glans, ·4 in. to ·5 in. in diameter and ·15 in. deep, gradually narrowed to a short, thick pedicel; lamellæ 4 to 6, bold, entire. *Glans* when quite ripe sometimes globular, usually ovoid-conic; the base always truncate, smooth, shining, ·7 in. long and ·6 in. in diameter.—*DC. Prod.* xvi. ii. 95; *Miq. Ann. Mus. Lugd. Bat.* i. 112; *Hook. fil. Fl. Br. Ind.* v. 613.

Western Sumatra,—*Teysmann*, *H. O. Forbes* (2560); Borneo,—*Beccari* (*P. B.* 1876); Penang,—*King's Collector* (1689), *Curtis* (363); Perak,—*Scortechini* (329*b*); *King's Collector* (6957, 6983).

A fine tree, attaining sometimes a height of 80 feet.

Specimens from Sumatra differ from those from Penang and Perak in having the petioles rather longer and more slender. The species is a very well-marked one, readily distinguished by its narrow, very coriaceous leaves. Its nearest allies are *Q. Miqueliana*, Scheff., and *Q. Wenzigiana*, King, but both these species have larger fruit.

PLATE 60A.—*Q. Rassa*, Miq. 1, branch with narrow leaves and unripe fruit (*from a Penang specimen*); 2, branch with broader leaves and nearly ripe fruit (*from a Perak specimen*); 3, young inflorescence (*from a Penang specimen*); 4, ripe acorns,—*all of natural size.*

56. QUERCUS CYRTORHYNCHA, *Miq. Fl. Ind. Bat. Suppl.* 350.

Young shoots puberulous or glabrous. *Leaves* thinly coriaceous, elliptic-oblong, acute, entire; the base acute or sub-acute; upper surface glabrous, not shining; lower paler, minutely puberulous or glabrous; nerves 10 to 14 pairs, slightly prominent below; length of blade 5 to 8 in., breadth 2·5 to 3 in.; petiole ·25 in. *Male spikes* in large, spreading, puberulous, terminal, panicles much longer than the leaves; female flowers on androgynous, solitary, axillary spikes. *Male flowers* sub-glomerulate; perianth 6-dentate; stamens 12. *Female flowers* solitary, or 2 or 3 connate. *Ripe cupules* solitary, sessile, on stout rachises longer than the leaves; when young campanulate, when adult saucer-shaped and embracing only the lower part of the glans; lamellæ 6 or 7, minutely tomentose, with entire sub-glabrous undulate edges, ·7 in. to ·9 in. in diameter, and ·2 to ·3 in. deep. *Glans* hemispheric with a truncate base and conical pointed apex, smooth, shining, ·7 in. to ·8 in. in diameter and about ·5 in. long.—*Hook. fil. Fl. Br. Ind.* v. 613.

Western Sumatra,—*Teysmann;* Borneo,—*Beccari* (*Herb. Becc. P. B.* 2168, 2880, 4031); Perak, at elevations of 500 to 3,000 feet,—*King's Collector* (7117, 10809, 10944).

A tree, 40 to 80 feet high. In its leaves this resembles *Q. Lamponga*, Miq. and *Q. Sundaica*, Bl., but the latter is a much more hairy plant: in its zonate cupules this differs from both. The fragments named *Q. cyrtopoda* by Miquel closely resemble this as to leaves.

PLATE 60B.—*Q. cyrtorhyncha*, Miq. 5, leaf-twig; 6, spike of nearly ripe fruit; 7, spike of ripe fruit; 8, ripe glans and cupule,—*all of natural size.*

57. QUERCUS DIEPENHORSTII, *Miq. Fl. Ind. Bat. Suppl.* 349.

Young branches minutely puberulous. *Leaves* coriaceous, shortly petiolate, elliptic, slightly oblique, entire; the apex with a rather abrupt short acumen; the base sub-acute, unequal; upper surface glabrous, shining; the lower pale and minutely reticulate; when young, minutely squamulose-tomentose, when adult glabrous; the midrib prominent on both surfaces, the 10 or 12 pairs of nerves slightly so on the lower; length of blade 4 to 6 in., breadth 2 to 2·5 in.; petiole ·4 in. *Ripe cupules* thin in texture, woody, sub-sessile, saucer-shaped, nearly glabrous, about 1 in. in diameter and ·2 in. deep; the upper edge slightly revolute; lamellæ about 6, entire. *Glans* turbinate-apiculate, with a truncate base; smooth, shining, ·5 in. long and ·8 in. in diameter. *Male flowers* unknown.—*Miq. Ann. Mus. Lugd. Bat.* i. 112; *DC. Prod.* xvi. ii. 95: *not of Wenzig in Jahrb. Bot. Gart. Berl.* iv. 231.

Sumatra,—*Diepenhorst.*

A very poor example of this in ripe fruit exists in the Utrecht Herbarium, and forms the type specimen of the species. Dr. Wenzig (l.c.) considers that Maingay's specimen (*Herb. Maing. Kew Distrib. No.* 1527) belongs to this species. I cannot agree in this view, for comparison shows that Miquel's specimen is quite different from Maingay's. The latter I have named *Q. Wenzigiana.*

PLATE 61 A.—*Q. Diepenhorstii*, Miq. 1, branch with ripe fruit; 2, glans; 3, cupule, *seen from above, the glans being removed;* 4, the same, *seen from below,—of natural size.*

58. QUERCUS RAJAH, *Hance in Journ. of Botany for* 1878, 198.

Young shoots puberulous or sub-glabrous. *Leaves* coriaceous, entire, rather broadly elliptic or oval, abruptly shortly and bluntly cuspidate, rather suddenly narrowed in the lower fourth to the stout petiole; upper surface glabrous, shining; under surface dull, minutely pubescent-lepidote when young, nearly glabrous when adult; nerves 10 to 12 pairs, slightly prominent beneath; length of blade 3·5 in. to 5 in., breadth 2 in. to 2·75 in.; petiole ·3 to 4·5 in. *Spikes* androgynous, on a sub-terminal fascicle, slightly longer than the leaves. *Cupules* solitary, nearly sessile, woody; when young, hemispheric and boldly 3 to 4-zonate. *Ripe cupule* nearly flat, covering only the base of the glans, ·6 in. in diameter; the lamellæ indistinct. *Glans* ovoid-hemispheric, apiculate; the base truncate, minutely sericeous; ·75 in. in diameter and ·75 in. long. *Q. Bancana*, Scheff., in part.

Bangka, Botae Balu,—*Teysmann ;* Indian Archipelago,—*Herb. Hort. Bot. Bogor.* (11484); Eastern Sumatra,—*H. O. Forbes* (3036*a*).

This is the plant of which Dr. Scheffer described the fruit in his first description of *Q. Bancana* (*Obs. Phyt.* ii. 49). On discovering his error, he subsequently described

(*Obs. Phyt.* iii. 94) the true fruit of *Q. Bancana* as I have here described and figured it. Unfortunately, however, some specimens of the present plant (*Q. Rajah*) were issued by Dr. Scheffer under the name *Q. Bancana.* I have seen ripe acorns of *Q. Rajah* nowhere except in the herbarium of the late Dr. Hance (now in the British Museum).

Plate 61B.—*Q. Rajah*, Hance. 5, twig with young acorns; 6, unusually broad leaf; 7, ripe glans; 8, cupule; 9, young acorns,—*all of natural size.*

59. Quercus Ewyckii, *Korth. in Verh. Nat. Gesch. Bot.* 212. *t.* 46.

Young shoots, under surfaces of the leaves, and the inflorescence minutely sub-lepidote-puberulous. *Leaves* thinly coriaceous, lanceolate or oblong-lanceolate (ovate-elliptic in var. *latifolia*), acute or acuminate; upper surface of adult leaves shining and glabrous except the midrib and 11 to 14 pairs of nerves which are minutely pubescent; under surface silvery grey, adpressed-pubescent; nerves prominent (and sometimes slightly coloured); length of blade 5 to 7 in., breadth 1·75 to 2·25 in.; petioles ·3 in. to ·5 in. *Flower-spikes* from 4 to 6 in. long, mostly males, forming few-branched, rather contracted, terminal panicles. *Male flowers* sub-glomerulate or solitary; the perianth 6-lobed; stamens 12; rudimentary ovary globular, villose. *Female spikes* one or two at the base of the male panicle. *Ripe cupules* solitary, sessile, or on very short, thick, annulate pedicels, saucer-shaped, embracing only the lower third of the glans, minutely tomentose; ·6 in. to 1 in. in diameter and ·15 in. to ·2 in. deep; lamellæ about 7 or 8, narrow but distinct, entire or finely denticulate. *Glans* depressed, hemispheric or ovoid-conic, apiculate, the base truncate; smooth and shining when adult. ·6 to ·8 in. long and ·5 to ·9 in. in diameter.—*Blume in Mus. Lugd. Bat.* i. 300; *DC. Prod.* xvi. ii. 94; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 230; *Hook. fil. Fl. Br. Ind.* v. 614.

Sumatra,—*Korthals;* Perak,—*King's Collector* (7846).

A considerable tree. The Perak specimens have slightly smaller acorns than those from Sumatra, but otherwise the plants are the same. In Dr. Hance's herbarium (now in the British Museum) a specimen collected by Mr. Curtis in Penang (No. 360) is named *Q. Ewyckii.* That plant has cupules with bold sausage-shaped lamellæ. It is identical with Maingay's Malacca specimen No. 1527, and is the species which I have named *Q. Wenzigiana.* True *Q. Ewyckii* is not well represented in any collection which I have consulted, except those at Leiden and Calcutta. In the former there is a good deal of it under a manuscript name of Korthals which I cannot decipher. This species much resembles *Q. Lamponga*, Miq., in leaf; but this has distinctly zonate cupules. On the other hand, there are forms of *Q. Lamponga* in which the cupular scales are arranged in verticels and their bodies are almost completely united, only the very tips being free. Such forms come so near *Cyclobalanus* as to be hardly distinguishable.

Var. latifolia.

Leaves ovate-elliptic, shortly and bluntly caudate-acuminate; lamellæ of cupule denticulate; glans ovoid-conic.

Perak,—*King's Collector*, *No.* 8532.

This variety is evidently not common: it does not occur in Scortechini's collection. In fruit this approaches *Q. daphnoidea.*

Plate 62A.—*Q. Ewyckii*, Korth. 1, leaf-twig; 2, spike of ripe fruit (*from a Perak specimen*): *of natural size.* B.—*Var. latifolia.* 3, leaf-twig; 4, spike of nearly ripe fruit; 5, ripe glans; 6, cupule,—*all of natural size.*

60. Quercus Clementiana, *King in Hook. fil. Fl. Br. Ind.* v. 614.

Young shoots glabrous, sub-glaucous. *Leaves* thinly coriaceous, oblong-lanceolate or oblanceolate, acuminate, entire; the base acute; both surfaces glabrous; the upper shining, the lower paler and dull; nerves 11 to 13 pairs, rather prominent below; length of blade 5 to 7·5 in., breadth 2 to 2·25 in.; petiole ·35 in. *Spikes* male or androgynous, axillary and solitary, or in small terminal panicles, shorter than the leaves. *Male flowers* sessile, 6-cleft; stamens 12; rudimentary ovary very large, pubescent. *Young cupules* sessile, solitary or in threes, truncate-pyriform, with 4 broad distinct sub-entire zones. *Ripe cupules* solitary or with one or two abortive cupules at their bases, saucer-shaped or sub-campanulate, covering only the lower half of the glans; lamellæ 5, broad, with entire but wavy edges; 1·25 in. in diameter and ·5 in. deep.

Penang,—*Maingay* (*No.* 1529); *Scortechini* (*without locality or number*).

The materials on which this species is founded are not so complete as might be desired. The point in which they more especially fail is that no leaf-specimen has ripe fruit actually attached to it. The young acorns which are attached agree, however, so well with the ripe detached ones picked up from under trees by Maingay, that there is practically no doubt of the identity of the two. The species resembles *Q. Wenzigiana*, King; but this has larger leaves, shorter spikes, and a different cupule. The ripe fruit of this also much resembles that of *Q. lucida*, Roxb. A plant very near, if not identical with, this was collected by Motley in Borneo (*Herb. Motley* 464 *and* 1168). I have named this species after Sir Cecil Clementi Smith, Governor of the Straits Settlements.

Plate 63A.—*Q. Clementiana*, King. 1, branch with male inflorescence; 2, spike of young acorns; 3, cluster of half-ripe acorns; 4, ripe acorn; 5, ripe cupule,—*all of natural size;* 6, male flowers: *enlarged.*

61. Quercus lucida, *Roxb. Fl. Ind.* iii. 635.

All parts, except the inflorescence, quite glabrous. *Leaves* rigidly coriaceous, obtusely lanceolate, oblanceolate or cuneate, shortly and obtusely mucronate or rounded, and sometimes slightly emarginate; the base acuminate; both surfaces glabrous and shining; nerves 8 to 10 pairs, not prominent on either surface; length of blade 5 to 7 in., breadth 1·75 to 2·25 in.; petiole about ·3 in., stout. *Spikes* androgynous, puberulous, in terminal panicles exceeding the leaves. *Male flowers* with 6-cleft perianth, 12 stamens and pubescent rudimentary ovary. *Ripe cupules* solitary by abortion, sessile, thick, saucer-shaped with in-curved edges, embracing only the base of the glans; lamellæ 6 or 7, bold, sausage-shaped, tomentellate, 1 in. in diameter and ·2 in. deep. *Glans* hemispheric with a truncate base and umbonate apex, smooth, shining, ·9 in. in diameter and ·65 in. high.—*Hook. fil. Fl. Br. Ind.* v. 614.—*Q. cuneata*, Herb. Roxb. in Wall. Cat. 3732; DC. Prod. xvi. ii. 108 (name only); Miq. Fl. Ind. Bat. 1. 863; Ann. Mus. Lugd. Bat. i. 116.

Penang,—*Maingay*, 1526, *King;* Singapore and Perak,—*King's Collector;* at low elevations. (*King's Collector* No. 5584, issued by mistake under this name, is *Wenzigiania*, King.)

A tree, from 40 to 100 feet high. Roxburgh's descriptions and, still more, his excellent coloured figure in the Calcutta Herbarium, put the identification of this species beyond the reach of doubt. Although this is one of the commonest oaks in Penang, specimens of it were absent from all the great European collections until the distribution from Kew of Maingay's plants. M. De Candolle (not having seen a specimen) suggests in the *Prodromus* the identity of this with *Q. lanceæfolia*, Roxb., which, however, it does not really resemble. On his unpublished figure Roxburgh has written the name *cuneata* as an alternative to *lucida*, and Wallich adopted the former in his Catalogue as above noted. The nearest ally of this is *Q. omalkos*, Korth.

PLATE 64.—*Q. lucida*, Roxb. 1, branch with male flower-spikes; 2, female flower-spikes; 3, spike of cupules, *half ripe;* 4, ripe acorn; 5, branch of a small-leaved form; 6, ripe fruit of the same,—*all of natural size;* 7, part of spike of male flowers: *enlarged.*

62. QUERCUS OMALKOS, *Korth. in Verh. Nat. Gesch. Bot.* 214.

All parts (the inflorescence excepted) glabrous. *Leaves* thinly coriaceous, lanceolate or oblanceolate, entire; the apex blunt (rarely shortly cuspidate); both surfaces quite glabrous and shining; nerves 10 to 14 pairs, slightly prominent on both surfaces; the reticulations distinct on the lower, and the midrib strong; length of blade 2 to 4 in., breadth 1 to 1·5 in.; petiole ·2 in. *Spikes* longer than the leaves, male or androgynous, slender, puberulous, solitary and axillary, or forming sparse, few-branched, terminal panicles. *Ripe cupules* solitary, sessile, saucer-shaped, thick-walled, with incurved lip; lamellæ 8 to 10, the lower broadest, minutely tomentose; their edges undulate, sub-entire, 1 in. to 1·25 in. in diameter and about ·25 in. deep. *Ripe glans* depressed-hemispheric, apiculate; the base truncate, smooth, shining, ·7 in. to ·9 in. in diameter and about ·6 in. long.—*Hook. fil. Fl. Br. Ind.* v. 614; *Blume Mus. Lugd. Bat.* i. 301; *Miq. Fl. Ind. Bat.* i. 860; *Ann. Mus. Lugd. Bat.* i. 112; *DC. Prod.* xvi. ii. 92; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 231.

Sumatra,—*Korthals;* Perak,—*Scortechini* (*King's Collector, Nos.* 5950, 6901, 8447, 8194); at elevations of from 500 to 3,000 feet.

A handsome tree, 50 to 100 feet in height, not uncommon in Perak. This is nearly allied to *Q. lucida*, Roxb., but the leaves of this are smaller, thinner in texture, and with much more distinct nervation. Moreover, they dry of a pale olive-green colour, while those of *lucida* dry of a deep brown.

PLATE 63B.—*Q. omalkos*, Korth. 6, leafy twig; 7 & 8, spikes of fruit in various stages of ripeness; 9, cupule, seen from above,—*of natural size.*

63. QUERCUS PLATYCARPA, *Bl. Fl. Javan. Cupulif.* 27. *t.* 15.

Young branches pale, lenticellate, glabrous. *Leaves* coriaceous, elliptic or sub-obovate-elliptic, entire, shortly and abruptly cuspidate; the base rounded or acute; upper surface glabrous and shining, lower dull, covered with a layer of minute, pale, lepidote pubescence; nerves 9 to 10 pairs, thin, slightly prominent; length of blade 4 to 6 in., breadth 2·25 to 2·8 in.; petiole ·5 in. *Spikes* androgynous, puberulous, in small, terminal, and axillary panicles; the *female flowers* few. *Male flowers* solitary or sub-glomerulate. *Ripe cupules* on a slender lenticellate puberulous rachis, shortly pedunculate, solitary by abortion, saucer-shaped, puberulous, embracing the lower third of the glans, 1·5 in. in diameter and 2 in. deep; the lamellæ about 5, rather prominent, entire, sharp-edged. *Glans* depressed-turbinate; the base truncate; the apex sub-conic, apiculate, smooth, and shining, 1·4 in. in diameter and ·6 in. long.—*Bl. Mus. Lugd. Bat.* i. 300; *DC. Prod.* xvi. ii. 92; *Miq. Fl. Ind. Bat.* i. 859; *Ann. Mus. Lugd. Bat.* i. 112; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 234.

Western Java,—*Teysmann.*

A fine species with leaves almost undistinguishable from those of *Q. costata*, but with a different fruit. Moreover, the young branches of this are pale and lenticellate, while those of *Q. costata* are dark-coloured and smooth. This has shorter panicles than *costata.*

PLATE 65.—*Q. platycarpa*, Bl. 1, branch with flowers and an unripe acorn; 2, spike of young acorns; 3, ripe cupule, *seen from below;* 4, ripe acorn, *seen from above,—all of natural size.*

64. QUERCUS TEYSMANNII, *Bl. Mus. Lugd. Bat.* i. 300.

Young shoots glaucous. *Leaves* with large sub-falcate persistent stipules, thinly coriaceous, oblong-lanceolate, shortly and rather abruptly acuminate or acute, entire; the base acute; upper surface glabrous and shining; lower pale, glaucous, very minutely hairy; nerves 9 to 12 pairs, slightly prominent below, obsolete above; length of blade 4 to 7 in., breadth 1·4 in. to 1·8 in.; petiole ·4 in. *Flower spikes* unisexual, axillary or terminal, solitary, or in small panicles shorter than the leaves. *Male perianth* 6-cleft; stamens 12; rudimentary ovary large and pubescent. *Cupules* on rather a slender rachis longer than the leaves, sessile, solitary; when young campanulate and covering two-thirds, when ripe saucer-shaped and covering only half, of the glans; 1·75 in. in diameter and ·4 in. deep; lamellæ about 6, bold, broad. *Ripe glans* turbinate with convex apex, or hemispheric-apiculate, smooth, shining, 1·2 in. to 1·4 in. in diameter and ·5 in. to 1 in. long.—*Miq. Fl. Ind. Bat.* i. 860; *Oudem. Annot. Cup. Javan.* 14. *t.* 8; *DC. Prod.* xvi. ii. 92; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 235 (*in part*).—*Q. annulata*, Korth. (not of Smith) Verh. Nat. Gesch. Bot. 213. t. 46. figs. 21, 22; Miq. in Ann. Mus. Lugd. Bat. i. 113.—*Q. Korthalsii*, Endl. (not of Blume) Gen. Suppl. 4. pt. 2. 28; Miq. Ann. Mus. Lugd. Bat. i. 113.—*Q. pseudo-annulata*, Bl. Mus. Lugd. Bat. i. 299; Miq. Fl. Ind. Bat. i. 858.—*Q. laurifolia*, Miq. (not of Willd.) Pl. Jungh. i. 11.—*Q. hypoleuca*, Miq. Fl. Ind. Bat. i. 869.

Java,—*Teysmann;* Sumatra,—*Teysmann, Forbes* (Nos. 1660, 1683).

This is allied to *Q. platycarpa*, Bl. by its fruit, but the glans of this is much longer. In leaf this closely resembles *induta*, Bl. The persistent stipules of this species are very remarkable, and afford an excellent diagnostic character.

PLATE 66.—*Q. Teysmannii*, Bl. 1, branch with ripe fruit; 2, male and female flower-spikes; 3 to 8, acorns in various stages of ripeness,—*all of natural size;* 9, male flowers: *enlarged.*

65. QUERCUS CYCLOPHORA, *Endl. Gen. Pl. Suppl.* iv. *pt.* 2. 28.

Young branches glaucescent or glabrous. *Leaves* large, coriaceous, oblong-lanceolate, acuminate, with entire, slightly-recurved edges; the base acute or acuminate; upper surface smooth and shining (in the younger stages sometimes sparsely and minutely lepidote); under surface covered, except the nerves and midrib, with dense minute pale tomentum; nerves (16 to 20 pairs) and midrib bold, prominent, sub-glabrous beneath; length of blade 6 to 10 or even 12 in., breadth 2 to 3 in.; petiole about ·5 in., stout.

Spikes androgynous, in small axillary or terminal panicles shorter than the leaves. *Male flowers* 6-toothed, with 12 stamens and conspicuous pubescent rudimentary ovary. *Ripe cupules* 1·5 to 2·25 in. in diameter, ·6 to ·8 in. deep, solitary, sessile, shallow, campanulate, covering only half the glans, very thick-walled (·25 in. thick); lamellæ about 10, rather bold, minutely tomentose, with irregular, undulate, glabrous edges. *Glans* patelliform; the apex sub-depressed, umbonate, 1·25 to 1·5 in. in diameter and ·5 in. high, densely and minutely furfuraceous-tomentose. *Hook. fil. Fl. Br. Ind.* v. 615; *Miq. in Ann. Mus. Lugd. Bat.* i. 113.—*Q. depressa*, Roxb. (not of H. B. K., nor of Bl.) Fl. Ind. iii. 640.—*Q. placentaria*, Wall. (not of Bl.) Cat. 2779.—*Q. Penangensis*, Miq. Fl. Ind. Bat. i. 859.—*Q. umbonata*, Hance in Trim. Journ. Bot. 1874, 241; 1875, 364.

Penang and Singapore,—*Wallich*, *Norris*, *Curtis*, *King*; Malacca,—*Maingay* (No. 1528); Perak,—*King's Collector* (2402, 6821, 6888); at elevations of 500 to 3,000 feet.

A magnificent tree, often attaining a height of 150 feet. Owing to the difficulty of obtaining its leaves and flowers, this species has been three times named from its acorns only (picked up under trees), and until now its leaves have not been described. Roxburgh's original name of *depressa* must unfortunately give way, as Humboldt had previously appropriated it for a South American species, and this circumstance having been observed by Endlicher, he rechristened it *cyclophora*, without, however, describing it. In the Calcutta Herbarium Roxburgh left a coloured drawing of the acorn, which makes the identification of his *depressa* a matter of absolute certainty. Wallich issued good specimens of this as *placentaria*, Bl., but a reference to the latter's published figure (*Fl Jav. Cup. t.* 9) shows that his *placentaria* is really one of the forms of the Protean *Q. spicata*, Sm. Miquel suggests that *Q. cyclophora* is allied to *rotundata*, Bl., but the suggestion is disposed of by an inspection of Blume's figure of the latter species (*l.c. t.* 11).

PLATE 67.—*Q. cyclophora*, Endl. 1, flowering branch; 2 to 4, ripe acorns; 5 & 6, cupules, seen from below,—*all of natural size;* 7, androgynous spike: *enlarged.*

66. Q. EICHLERI, *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 236.

Young shoots pale, glabrescent. *Leaves* thinly coriaceous, oblong-lanceolate, acuminate; the edges entire, slightly recurved when dry; the base acuminate; both surfaces dull, covered with very minute whitish pubescence, sub-glaucescent; nerves 8 to 9 pairs, much curved, ascending obliquely, prominent beneath; length of blade 7 to 11 in., breadth 1·75 to 3 in.; petiole ·3 to ·5 in. *Spikes* longer than the leaves, axillary, or in few-branched terminal panicles; the female spikes nearly as numerous as the male. *Male perianth* deeply 6-cleft; stamens 12; rudimentary ovary rather small, sericeous. *Cupules* sessile, solitary, depressed-globular when young and enveloping the whole of the glans except its apex; when ripe, saucer-shaped or even discoid, wider than the glans and embracing only the lower half of it, remotely and minutely denticulate, griseous-puberulous, from ·9 in. to 1·3 in. in diameter, and ·25 to ·35 in. deep; lamellæ about 6, broad. *Glans* (globose-conic when young) depressed-turbinate when ripe, and crowned by the short thick column of styles, minutely pubescent, ·8 in. to 1 in. in diameter, and about ·5 in. long.—*Hook. fil. Fl. Br. Ind.* v. 615.

Sumatra,—*H. O. Forbes;* Perak, very common.

A spreading tree, from 30 to 60 feet high, with spreading crown; the leaves pale green and silvery, especially beneath. This is a very distinct and handsome species. In its leaves it much resembles *Q. Curtisii*, King, a small tree collected by me in Penang, but the acorns of the two are very unlike. This also resembles *Q. induta*, but has narrower leaves and a different acorn. The leaves of this are undistinguishable from those of the specimen in the Leiden Herbarium named *Q. oligoneura*, Korth. As Korthals does not describe the fruit of *oligoneura*, I have treated it as a doubtful species. At the same time I think it very likely that *Eichleri* and *oligoneura* are one and the same; and if so, Korthals' (being the older name) would stand.

PLATE 68.—*Q. Eichleri*, Wenzig. 1, branch with flower-spikes; 2, spike of unripe acorns; 3, spike of ripe acorns; 4, ripe glans,—*all of natural size;* 5, male flowers: *enlarged.*

67. Q. THOMSONI, *Miq. in Ann. Mus. Lugd. Bat.* i. 109 (name only).

Young branches and leaves deciduously puberulous. *Leaves* oblong or elongate-lanceolate, acuminate, entire, much narrowed to the acuminate base; upper surface glabrescent or glabrous when adult; lower surface pale, glabrescent; main nerves about 10 pairs, rather prominent below; length of blade 4 to 5 in., breadth 1·5 in. to nearly 2 in.; petiole ·35 to ·5 in. *Spikes* terminal, solitary, or in fascicles of 2 or 3, rather longer than the leaves, mostly androgynous; male flowers above, female flowers below; male perianth 5-cleft, cinerescent externally; anthers about 12. *Female flowers* in glomeruli of 3, sessile, minutely bracteolate, containing a number of abortive stamens; styles 3, cylindric, spreading. *Ripe fruit* on stout, erect rachises. *Cupules* solitary by abortion, or with 2 undeveloped at the base; the cupule woody, saucer-shaped, shallow or quite flat, ·5 to ·75 in. across, embracing only the base of the glans, to which it has a broad attachment; its scales densely pubescent, connate, except the very tips. *Glans* crowned by the short remains of the united styles, depressed-globose or pyriform-globose, densely covered with minute white tomentum when young, glabrous when very old; from ·5 in. high in the depressed-globose to ·75 in. high in the pyriform-globose forms, and from ·4 to ·65 in. across.—*Hook. fil. Fl. Br. Ind.* v. 615.—*Q. turbinata*, Roxb. (not of Blume). Fl. Ind. iii. 636; Wight's Icon. 221.—*Q. leucocarpa*, Hook. fil. and Thoms. MSS.; Wenzig in Jahrb. Bot. Gart. Berl. i. 225.

Khasia Hills,—*Griffith* (*Kew Distrib.* 4476), *Hook. fil.*, *G. Mann*, *C. B. Clarke;* at elevations of from 2,000 to 5,000 feet; Burmah,—*Kurz;* not found in Chittagong since Roxburgh's time.

A considerable tree, often attaining a height of 80 to 100 feet; not unlike *Q. dealbata*, Hook. fil. and Th., in foliage, but differing greatly in the fruit. This species was collected by Roxburgh in Chittagong, and was described in his *Flora Indica* (iii. 636) prior to 1815 under the name *Q. turbinata*. Blume's species of the same name, but a totally different plant from Roxburgh's, was published in 1825, and (owing to the delay in the publication of Roxburgh's book) therefore takes precedence. Blume's *Q. turbinata* is now, however, reduced to a variety of the same author's *Q. lineata*. Roxburgh left an admirable drawing of his *Q. turbinata* in the Calcutta Herbarium, so there is no doubt whatever as to his plant. Miquel (l.c.) gave the name *Thomsoni* to

Roxburgh's *turbinata,* and it was issued by Hook. fil. and Thomson in their *Herb. Ind. Or.* under the MSS. name *leucocarpa.*

Plate 69A.—*Q. Thomsoni,* Miq. 1, branch with inflorescence, bearing androgynous spikes; 2, spike of depressed-globular fruit; 3, a single pyriform-globose fruit,—*of natural size;* 4, male flower; 5, section of female flower: *both enlarged.*

SECTION V.–CHAMYDOBALANUS.

Chamydobalanus.—*Spikes erect; male flowers, styles, and leaves as in* PASANIA. *Involucres ovoid or globose, externally zonate or tubercular, closed and enveloping the whole glans (except the apex in* CONFRAGOSA *and* BLUMEANA), *but not adnate to it, except at the base; the glans escaping from the cupule when ripe.*

- Involucres tubercled or spinulose.
  - Fruit hemispheric or turbinate.
    - Involucres depressed-globose, the young echinulate with simple weak aristæ; the mature with faint bands . . . . 68. *Q. Blumeana.*
    - Involucres with sharp, subulate, simple or branching spines in tufts or interrupted zones . . . . 69. *Q. discocarpa.*
    - Involucres with stout, simple, radiating, hooked spines . . . . 69 *bis.* *Q. Wrayii.*
  - Fruit globular; involucre with coarse, short, blunt, irregular, scattered tubercles . . . . 70. *Q. confragosa.*
  - Fruit ovoid; involucre with scattered sub-ligneous, reflexed, subulate tubercles . . . . 71. *Q. reflexa.*
  - Fruit ovoid-complanate, oblique; involucral tubercles short, stout, sometimes sub-zonate . . . . 72. *Q. Junghuhnii.*
- Involucres zonate, not tuberculate.
  - Fruit ovoid or ovoid-globose . . . . 73. *Q. lanceæfolia.*
  - ,, depressed-hemispheric . . . . 74. *Q. encleisocarpa.*

68. QUERCUS BLUMEANA, *Korth. Verh. Nat. Gesch. Bot.* 208. *t.* 44.

Young shoots pale, pulverulent. *Leaves* coriaceous, oblong or narrowly elliptic-lanceolate, shortly acuminate, entire; the base acute; upper surface glabrous; lower pale, very minutely stellate-tomentose; main nerves 10 to 12 pairs, rather straight, strong and prominent beneath; length of blade 5 to 8 in., breadth 1·50 to 2·75 in.; petiole ·5 to ·75 in., stout. *Spikes* erect, simple, axillary, or in terminal panicles, male or androgynous; male perianth 6-cleft; stamens 12; rudimentary pistil spheroid, pubescent. Mature female spikes rather longer than the leaves, solitary, axillary; the rachis very thick, lepidote-puberulous, much lenticellate, the flowers solitary. Acorns solitary on very stout, short, pedicels; depressed-turbinate when young, hemispheric-conic when adult; the cupule closely enveloping the whole of the glans except the styles; when young echinulate-puberulous, when mature faintly banded; ·75 in. in diameter and ·6 in. long. *Ripe glans* conic-hemispheric with a truncate base.—*Hook. fil. Fl. Br. Ind.* v. 615; *Blume Mus. Lugd. Bat.* i. 288; *Miq. Fl. Ind. Bat.* i. 1. 863; *Ann. Mus. Lugd. Bat* i. 116; *DC. Prod.* xvi. ii. 103; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 237.

Borneo,—*Korthals*; Sumatra,—Perak, *Scortechini* (*without number*); *King's Collector* (3232); at elevations of from 3,000 to 4,000 feet.

A tree, 40 to 50 feet high. In the half-ripe condition the glans of this species is concave at the base and very much depressed; when mature it becomes more hemispherical with a conical apex and truncate base. The cupule splits irregularly but vertically in its upper half when it is quite ripe, thus allowing the glans to escape. In its leaves this somewhat resembles *Q. Cantleyana*, King, and *cyclophora*, Endl.; but it differs from both entirely in its fruit. This species is represented in the Leiden Herbarium by three leaf specimens, some male spikes, and a single acorn. Two of the leaf specimens are named apparently in Korthals' own handwriting. The leaves of these are thinner in texture than my Perak specimens, but otherwise they agree. There is a single specimen from Leiden in M. De Candolle's Herbarium. Korthals' excellent figure and description, however, leave no doubt as to this species.

PLATE 69B.—*Q. Blumeana*, Korth. 6, leaf-twig; 7, spike of half-ripe acorns; 8, ripe acorn, the cupule having split in its upper half; 9, cupule from which acorn has escaped; 10, young cupule opened up; 11, glans seen from above; 12, from the side; 13, from below; 14, male spike,—*all of natural size.*

69. QUERCUS DISCOCARPA, *Hance Journ. of Botany for* 1874, 242.

Young shoots covered with minute furfuraceous tomentum, lenticellate. *Leaves* coriaceous, lanceolate or oblong-lanceolate, shortly acuminate, entire; the base acute; upper surface glabrous, the lower minutely rufous-tomentose; the 9 or 10 pairs of nerves thin, but prominent; length of blade 3·5 in. to 5 in., breadth 1·25 in. to 2 in.; petiole ·25 in., stout. *Spikes* in erect, terminal, spreading, tomentose panicles; the *female spikes* short, few in number, and only at the apices of the panicles; *female flowers* solitary. *Ripe fruit* ·5 in. long and ·75 in. broad, sub-sessile, hemispheric or turbinate; the base truncate and concave; the involucre completely investing the whole of the glans except the styles, minutely tawny-tomentose, and bearing numerous tufts or broken lines of simple or branching, spreading, pubescent, sharp-pointed, thin spines, from ·15 in. to ·3 in. long. *Glans* of the same shape as the involucre, twice as broad as long, minutely adpressed-pubescent; the base very concave.—*Hook. fil. Fl. Br. Ind.* v. 616.—*Castanopsis discocarpa*, Hance Journ. Bot. for 1878, 201.

Bangka,—*Teysmann*; Perak,—*King's Collector* (5482).

Mr. Kunstler describes this as a tree from 100 to 130 feet high. In leaf it resembles *Castanopsis*, but the fruit is quite different. Hance originally described this as a *Quercus*, but he subsequently considered that, if the genus *Castanopsis* is to be kept up, it must be transferred to it. As the involucres are indehiscent and never contain more than one glans, I do not see why this should not be kept where its lamented author originally put it, viz. in *Chamydobalanus*. It is closely allied to *Q. reflexa*, which has, however, glabrous leaves and simple involucral spines.

PLATE 70.—*Q. discocarpa*, Hance. 1, branch with inflorescence; 2, spike of ripe fruit; 3 & 4, ripe fruits (from another specimen); 5, young fruit,—*all of natural size.*

69 BIS. QUERCUS WRAYII, *King, nov. spec.*

Young parts, and especially the branches, densely and minutely fulvous-tomentose; the older branches pale, glabrous. *Leaves* oblong-lanceolate, caudate-acuminate; the edges when dry reflexed; the base acute, unequal-sided; upper surface pale, sparsely and minutely stellate-tomentose; the midrib densely tomentose; lower surface puberulous, glabrescent with age; nerves 12 to 15 pairs, prominent on both surfaces, but especially on the lower; length of blade 6 to 8 in., breadth 1·5 to 2 in., petiole ·15 in. *Fruit* on axillary tomentose spikes shorter than the leaves; acorns sessile, solitary; cupule fulvous-tomentose, depressed; when young almost discoid, enveloping the whole of the glans, and completely covered by stout simple radiating spines, straight except at the extreme apex which is hooked. *Glans* depressed, fulvous-sericeous.

Kota, in Perak,—*Mr. L. Wray, Junior.*

This species approaches *Q. discocarpa*, Hance, and *reflexa*, King, but differs from both in leaf as well as in fruit. Mr. Wray has as yet collected no male flowers, and his only specimens of fruit are young. The figure which I give shows, therefore, only immature fruit, but the degree of its immaturity it is impossible to determine.

PLATE 104.—*Q. Wrayii*, King. Twig with young leaves and immature fruit,—*of natural size.*

70. QUERCUS CONFRAGOSA, *King in Hook. fil. Fl. Br. Ind.* v. 616.

Young shoots covered with pale, deciduous scurf. *Leaves* rigidly coriaceous, from oblong-lanceolate to elliptic-oblong, acute or very shortly and bluntly cuspidate; edges entire, slightly recurved; the base acute; upper surface canescent, lepidote or glabrous; lower uniformly covered with a layer of minute, dense, whitish tomentum; the midrib and nerves sub-glabrous when old; nerves 6 or 7 pairs, obsolete on the upper, bold and prominent on the lower surface; length of blade 5·5 to 7 in., breadth 2 to 3 in.; petiole about ·5 in., stout. *Fruiting-spikes* longer than the leaves, rather slender. *Cupules* solitary, sessile; when young, globular and enveloping all but the apex of the glans; when ripe, globular with depressed apex and slightly contracted base, completely enveloping the glans, irregularly and coarsely tuberculate; 1·25 in. in diameter and 1·1 in. high. *Ripe glans* completely enveloped by the cupule, depressed-hemispheric; the base truncate, concave, minutely tomentose, 1 in. in diameter and from ·6 to ·75 in. high. Male spikes unknown.

Perak,—*King's Collector* (Nos. 8123 and 8188); at low elevations.

A tree, 40 to 50 feet high. The leaves of this resemble those of *Q. induta*, Bl., but they have fewer nerves and are more coriaceous than those of that species. The cupules of this are very remarkable and unlike those of most species of oak. They are in the young state comparatively smooth, and do not completely envelope the glans; but as they ripen, they become boldly but bluntly tuberculate, and finally envelope the entire glans, covering even the insertion of the styles. In texture the cupules are brittle and crustaceous, not fibrous.

PLATE 71.—*Q. confragosa*, King. 1, branch with nearly ripe fruit; 2, ripe fruit; 3, branch with unripe fruit; 4, nearly ripe glans,—*of natural size.*

71. QUERCUS REFLEXA, *King in Hook. fil. Fl. Br. Ind.* v. 616.

Young parts minutely pulverulent-pubescent. *Leaves* thinly coriaceous, oblong to elliptic-oblong, shortly acuminate, entire, slightly narrowed to the sub-unequal base; main nerves 8 to 12 pairs, alternate, prominent below; upper surface at first minutely cinereous-pubescent, ultimately shining and glabrous, except the midrib and nerves; lower surface rather pale, minutely furfuraceous-pubescent, especially on midrib and nerves; length of blade 4·5 in. to 6 in., breadth 1·75 in. to 2 in.; petiole about ·25 in., stout, cinereous-pubescent. *Fruit-spikes* solitary, axillary, erect; the rachis puberulous, minutely lenticellate. *Cupules* solitary, sessile, ovoid-conic, pubescent, completely covering the glans, and bearing externally many subulate, reflexed, sub-ligneous, spine-like, scales; nearly 1 in. long and ·75 in. in diameter. *Glans* of the same shape as the cupule, and completely covered by but separable from it, minutely tomentose, crowned by the united styles.

Borneo in Sarawak,—*Beccari* (*Herb. Becc. P. B.* 4056 and 4057).

Flowers of this are not known. Its affinities are with *Q. lappacea*, Roxb., but its leaves are less hairy, and its cupule completely envelopes the glans, apparently even when ripe.

PLATE 72.—*Q. reflexa*, King. 1, branch with fruit supposed to be ripe; 2, glans after removal of the cupule,—*of natural size.*

72. QUERCUS JUNGHUHNII, *Miq. Fl. Ind. Bat.* i. 1. 853.

Young shoots thin, dark-coloured, sub-glabrous. *Leaves* coriaceous, lanceolate or ovate-lanceolate; the apex caudate-acuminate; the edge coarsely serrate in the upper half; the base acute or sub-acute; upper surface glabrous, shining; the lower densely covered with pale, rufous, minute, furfuraceous tomentum; the nerves 8 to 10 pairs, prominent below; length of blade 2·5 to 4·5 in., breadth ·8 to 1·4 in.; petiole ·2 in to ·3 in. *Male spikes* in lax, axillary, terminal and erect panicles; flowers sub-glomerulate, 6-partite; stamens about 12. *Female spikes* longer than the leaves, solitary, axillary; the rachis lenticellate; the flowers distant, solitary, sessile, ovoid; their involucres squamose-tuberculate. *Ripe acorns* obliquely ovoid; the cupule woody, closely enveloping the whole of the glans, internally villous, externally minutely fulvous-tomentose, and with many stout, sub-recurved tubercles which are sometimes obscurely arranged in zones; length ·6 to ·75 in., diameter about ·5 in. *Glans* ovoid-apiculate, flattened on one side; the base truncate, adpressed-pubescent.—*Miq. in Ann. Mus. Lugd. Bat.* i. 117; *Oudem. Annot. Crit. Cup. Javan.* 15. *t.* 9; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 237.—*Q. acuminatissima*, DC. Prod. xvi. ii. 102.—*Q. fagiformis*, Jungh. in Nat. Tijdsch. Ind. ser. iii. 4, 119, and in Bonplandia vi. 82 (*cum icone*); Miq. Fl.

Ind. Bat. i. 870 (under-genus *Phegopsis*).—*Q. lineata*, Miq. (not of Blume) Pl. Jungh. i. 10; *Castanea acuminatissima*, Bl. Mus. Lugd. Bat. i. 283; Miq. Fl. Ind. Bat. i. 1, 867.—*Castunea ? sessilifolia*, Bl. Mus. Lugd. Bat. i. 284, *in part;* Miq. Fl. Ind. Bat. i. 1. 867.

Western Java,—*Blume*, *Teysmann*, *De Vriese*, *Junghuhn*, *Forbes* (335, 941); at elevations of 4,000 to 5,000 feet.

A large tree. Fruiting specimens are by no means common in herbaria, and really good ripe fruit is a desideratum.

PLATE 73.—*Q. Junghuhnii*, Miq. 1, branch with male inflorescence; 2, branch with spikes of female flowers; 3 to 7, acorns in various stages of ripeness—*from various specimens;* 8 & 9, twigs from an entire-leaved specimen,—*all of natural size.*

73. QUERCUS LANCEÆFOLIA, *Roxb. Fl. Ind.* iii. 634.

All parts, except the inflorescence, glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, rarely ovate-lanceolate, acuminate, entire; the base acute, rarely rounded; both surfaces smooth—the upper shining, the lower dull; main nerves 10 to 12 pairs, thin, but slightly prominent on both surfaces when dry; length of blade 4 to 6 in., breadth 1·5 to 2 in.; petiole ·4 in. to ·5 in. *Spikes* in large, erect, spreading, terminal panicles, a few of them androgynous; the rachises minutely cinereous-tomentose. *Male flowers* solitary, puberulous, about 6-cleft; stamens 12. *Female flowers* either in panicles in distinct trees, or a few near the apex of the male spikes, solitary; the *cupules* from the first enveloping the glans; thin, crustaceous, sub-sessile, ovoid to ovoid-rotund, deciduously lepidote-tomentose, becoming sub-glabrous, marked externally with 4 to 6 wavy, sub-concentric, sub-denticulate or entire ridges; apex penetrated by the remains of the united styles; ·65 in. in diameter and ·75 in. to nearly 1 in. long. *Glans* exactly fitting the interior of the cupule, minutely adpressed-sericeous in its upper three-fourths; the lower fourth attached to the cupule, rugose, glabrous.—*Wall. Cat.* 3733; *Wight Icon.* 212; *DC. Prod.* xvi. ii. 102. (excl. syn. *Q. lucida*, Roxb.); *Miq. in Ann. Mus. Lugd. Bat.* i. 116; *Wenzig Jahrb. Bot. Gart. Berl.* iv. 236; *Hook. fil. Fl. Br. Ind.* v. 616; *Gamb. Ind. Timb.* 388.—*Castanopsis lanceæfolia*, Kurz F. Flor. B. Burm. ii. 482.—*Q. glomerata* (not of Roxb.) Wall. Cat. 2791.—*Castanea tribuloides*, Wall. Cat. 2765 B.—*Q. fenestrata* (not of Roxb.) Wall Cat. 278 4, *in part.*

Sikkim and Bhotan Himalaya; Hill Ranges of Assam; Chittagong,—*Gamble;* Upper Burmah, at Poneshee—*J. Anderson.*

VAR. SEMI-CRISTATA, *King in Hook. fil. Fl. Br. Ind.* v. 616.

Cupules smaller than in the typical form: their ridges sharply denticulate.—*Q. Kurzii*, Hance in Journ. *Bot. for* 1878, 328.—*Castanopsis semi-cristata*, Kurz MSS.

Khasia Hills,—*G. Mann.*

This is a very distinct and well-marked species. There is, however, some confusion in the Wallichian distribution of it. As will be seen from the numbers of his Catalogue above quoted, Wallich distributed specimens of it under no less than four names. His No. 2791 is named *Q. glcmerata*, Roxb., and is noted as from Penang (whence Roxburgh's *Q. glomerata* is said to have come). On the tickets on the Kew and Calcutta specimens of No. 2791 (all of which are unmistakeable *lanceæfolia*) "Sylhet" is given as the habitat, and no doubt correctly. De Candolle (in *Prod.* l.c.) quotes 2791 under *lanceæfolia;* but he perpetuates Wallich's error of attributing it to Penang instead of Sylhet.

PLATE 74.—*Q. lanceæfolia*, Roxb. 1, flowering-branch; 2, spike of ripe acorns; 3, ripe acorn of var. *semi-cristata,—of natural size ;* 4, bracteole ; 5 & 6, male flowers ; 7, stamens; 8, ovaries,—*all enlarged.*

74. QUERCUS ENCLEISOCARPA, *Korth. in Verh. Nat. Gesch. Bot.* 208. *t.* 45.

Young parts at first pulverulent-puberulous, speedily glabrous. *Leaves* coriaceous, oblong-lanceolate or ovate-lanceolate, acuminate, entire; the base acute or sub-acute; upper surface glabrous, shining; the lower glaucescent; main nerves 7 or 8 pairs, curving, prominent on the lower surface; length of blade 3 to 5·5 in., breadth 1·5 to 1·75 in.; petiole ·4 in. *Male spikes* erect, twice as long as the leaves, in lax, terminal, pubescent panicles ; flowers glomerulate, 6-cleft; stamens 6 to 12; rudimentary ovary large, pubescent. *Female spikes* (on different trees ?) not much longer than the leaves, simple, solitary, axillary; the rachis angular, glabrous; flowers solitary, rarely in twos or threes, on long, flattened peduncles. Young acorns globular; adult solitary, or with 2 or 3 abortive at the base. *Cupules* enveloping the whole glans except the very apex (three-fourths in var. *aperta*), thin, chartaceous, closely enveloping the depressed-hemispheric, conic-apiculate, pale, retroversely adpressed-sericeous glans; ·8 in. in diameter and ·5 in. long when ripe; pedicels ·5 in. long.—*Blume Mus. Lugd. Bat.* i. 288; *DC. Prod.* xvi. ii. 104; *Miq. Fl. Ind. Bat.* i. *pt.* 1. 862; *Ann. Mus. Lugd. Bat.* i. 116; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 238; *Hook Fl. Br. Ind.* v. 617.

Sumatra,—*Korthals*, *Forbes* (2943); Malacca,—*Maingay* (1531): Perak and Penang,—*King's Collector* (1581, 2828, 5143, 5477, 5523, 5594, 5682, 5689, 7541, and 5739); up to elevations of 1,000 feet.

VAR. APERTA, *King in Hook. fil. Fl. Br. Ind.* v. 617.

The upper fourth of the glans not covered by the cupule at any stage.

Perak,—*King's Collector* (4855, 8303) *and Scortechini* (*without number*).

A tree, from 60 to 80 feet high. In the typical form the upper part of the cupule splits off in pieces, so that the glans may escape. In the var. *aperta* the upper fourth of the glans is, from the earliest stages, uncovered by the cupule. In the Sumatra specimens the acorns are more ovoid and less depressed than in those from the Malayan Peninsula and Penang. The species is a very distinct one.

PLATE 75.—*Q. encleisocarpa*, Korth. 1, flowering-branch ; 2, young female spike; 3, mature acorns; 4, young acorns of var. *aperta,—all of natural size.*

SECTION VI.–LITHOCARPUS.

Lithocarpus.—*Spikes erect; styles and leaves as in* PASANIA. *Involucres large, thick, woody, ovoid or sub-globose, concentrically or obliquely zonate, or tubercled, completely enveloping the glans (except in* COSTATA *and* ROTUNDATA, *where the apex is naked), and more or less adhering to it, not dehiscent; pericarp of glans osseous or granular, not polished where adherent to the involucre.*

Cupule zonate.
Acorns much broader at the apex than at the base.
Apex naked, shining . . . . 75. *Q. costata.*
Apex covered by the umbonate involucre . . . . 76. *Q. Maingayii.*

Acorns ovoid-spheroid, narrowed towards the apex.
Leaves pale and minutely tomentose on the lower surface . . . . . 77. *Q. Beccariana.*
Leaves glabrous, their surfaces concolorous . . . . 78. *Q. Javensis.*

Cupule tubercled, not zonate.
Glans entirely covered by the involucre . . . . 79. *Q. xylocarpa.*

Apex of glans not covered by the involucre.
Female flowers in threes, connate in fruit, one or more aborting . . . . 80. *Q. truncata.*

Female flowers solitary.
Cupule minutely tubercled only in its upper third; the lower part smooth . . . . 81. *Q. rotundata.*
Cupule everywhere boldly tubercled . . . . 82. *Q. pulchra.*

75. QUERCUS COSTATA, *Bl. Bijdr.* 522.

Young branches slightly lepidote, speedily becoming glabrous. *Leaves* coriaceous, elliptic-oblong or elliptic-lanceolate (sometimes oblanceolate), rather abruptly and shortly cuspidate, entire; the base acute; upper surface glabrous, shining; lower surface slightly paler, dull, glaucescent; the midrib prominent on both surfaces; the 9 to 12 pairs of nerves distinct only on the lower; length of blade 4 to 6 in., breadth 1·65 in. to 1·85 in.; petiole ·3 in. to ·6 in. *Male spikes* longer than the leaves, solitary and axillary, or in lax few-branched terminal panicles, minutely puberulous. *Female spikes* single, solitary. *Male flowers* in glomeruli of 3, each glomerulus subtended by a long linear bracteole; perianth 6-dentate; stamens 12. *Cupules* shallow, solitary, on stout, annulate peduncles; at first depressed-turbinate, wider than the glans; when adult, turbinate-hemispheric; the edge incurved, minutely tomentellate; the lamellæ about 8, or as few as 4, bold, the lower wide and slightly oblique, the upper approximate and concentric, the edges of all entire. *Glans* depressed-spheroidal or patelliform, enveloped by the closely-applied cupule, except on the broad, flat, and truncate or convex, glabrous, shining apex; 1 to 1·5 in in diameter and ·75 in long.—*Blume Fl. Javan. Cupul.* 25 *t.* 13; *Mus Lugd. Bat.* i. 301; *Korthals Verh Nat. Gesch.* 212; *DC. Prod.* xvi. ii. 93; *Miq. Fl. Ind. Bat.* i. 1. 862; *Ann. Mus. Lugd. Bat.* i. 116; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 239; *Hook. fil. Fl. Br. Ind.* v. 617.—*Q. costata*, Bl., var. *convexa*, Bl. Fl. Jav. Cupul. 26. t. 14; Mus. Lugd. Bat. i. 302; DC. Prod. l.c. 94.—*Lithocarpus scutigera*, Oudem. Ann. Crit. Cup. Javan. 20. t. 12.

Java and Sumatra,—*Korthals*, *Teysmann;* Perak,—*Scortechini* (*without number*); *King's Collector* (4891, 5166, 5584, 5783, 7277).

This is rather variable as to the shape of its fruit. Both the typical form and that which was named *Q. convexa* by Blume occur in Java and Sumatra. In Perak only the latter has yet been found. The leaves of this species are very like those of *platycarpa* and of *Wenzigiana*, but the fruit of the latter is very different.

PLATE 76A.—*Q. costata*, var. *convexa*, Bl. 1, branch with young fruit; 2, spike of ripe fruit,—*of natural size.*

76. QUERCUS MAINGAYII, *Benth. in Hook. Ic. Plant.* 1314.

Young branches and inflorescence minutely fulvous-tomentose. *Leaves* coriaceous, ovate-lanceolate, shortly acuminate, entire; the base acute; upper surface glabrescent; the midrib and nerves on both surfaces minutely lepidote-pubescent; under surface covered with very minute, pale, stellate, pubescence; main nerves 15 to 18 pairs, bold and prominent on the under surface; length of blade 8 to 10 in., breadth 3 to 4 in.; petiole about 1 in., stout, minutely tomentose. *Female spikes* solitary, axillary, shorter than the leaves; the rachis puberulous; flowers solitary, sessile. *Ripe acorns* on short thick peduncles, narrowly pyriform, with truncate umbonate apex. *The cupule* woody, about ·2 in. thick, closely enveloping the whole glans except its styles, and for the most part adherent to the glans, indehiscent, externally minutely tomentose, with about 3 obscure, wavy, oblique lamellæ; length about 1·5 in.; breadth ·8 in., peduncle less than ·5 in., very thick.—*Hook fil. Fl. Br. Ind.* v. 617.

Penang,—*Maingay* (No. 1464), *Curtis.*

Mr. Bentham describes the flat umbonate apex of the cupule as dehiscing in a circumscissile manner; but I have seen no specimen showing any appearance of dehiscence. Dr. Wenzig considers this species to be reducible to *Q. Javensis*, Miq.; but, although resembling that in its acorn, this differs *toto cœlo* from it in its leaves.

PLATE 77.—*Q. Maingayii*, Benth. 1, twig with ripe fruit; 2, spike of young acorns,—*of natural size.*

77. Quercus Beccariana, *Benth. in Hook. Ic. Plant.* 1315.

Young shoots minutely puberulous. *Leaves* coriaceous, lanceolate, shortly acuminate, entire, the base acute; upper surface glabrous, the lower pale and minutely tomentose; main nerves 5 to 6 pairs, prominent; length of blade 2·5 in. to 3·5 in., breadth 1 in. to 1·4 in.; petiole about ·5 in., slender. *Male spikes* short, in shortly-branched, erect, terminal panicles, much longer than the leaves; perianth 5-cleft; stamens 10. *Female spikes* at the base of the panicle, solitary, axillary, pubescent; flowers solitary, sessile; the involucre 7-zoned; styles 3, short. *Ripe acorns* ovoid or obovoid, prominently umbonate, sessile. *Ripe cupule* woody, thick-walled, indehiscent, closely enveloping the whole of the glans except the styles, and partly adnate to it; externally sub-glabrous, rugose, with 4 to 5 slightly prominent, wavy zones; length 2 in. to 2·5 in., diameter 1·5 in.—*Hook. fil. Fl. Br. Ind.* v. 617.

Borneo,—*Beccari* (*P. B. No.* 3310); Penang,—*Curtis.*

This is also referred by Dr. Wenzig to *Q. Javensis*, Miq., from which, however, it differs greatly in its leaves.

Plate 78.—*Q. Beccariana*, Benth. 1, branch with flowers and young fruit; 2, ripe fruit; 3, longitudinal section of the same,—*of natural size;* 4, male flower; 5, female flower; 6, longitudinal section of the same: *enlarged. Copied from Hooker's Icones Plantarum, t.* 1315.

78. Quercus Javensis, *Miq. Ann. Mus. Lugd. Bat.* i. 117.

Young shoots glabrous (? glaucous). *Leaves* thickly coriaceous, ovate-lanceolate, acuminate, entire; the base acute or acuminate; upper surface glabrous, shining; lower very minutely lepidote-pubescent, glabrous when old; main nerves indistinct, about 6 or 7 pairs, forming loops at some distance inside the edge; the secondary nerves and reticulations very distinct; length 2·5 in. to 3·5 in., breadth 1·25 in. to 1·75 in.; petiole ·25 to ·5 in. *Inflorescence* androgynous; the spikes longer than the leaves and on lax, axillary and terminal, erect panicles. *Male flowers* crowded, sub-glomerulate; the perianth 6-cleft; stamens about 12; rudimentary ovary large, villous. *Female flowers* at the base of some of the lower male spikes. *Acorns* pedunculate, obovoid when young, ovate-spheroid when adult; the apex narrow, depressed-truncate, 1·5 in. long and 1·25 in. in diameter; peduncle ·25 in. *Cupule* woody, about ·1 in. thick, enveloping the whole of the glans except its apex, and partly adnate to it; minutely lepidote-puberulous externally, with 3 or 4 obscure wavy zones. *Glans* bony, rugose.—*DC. Prod.* xvi. ii. 104; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 238.—*Lithocarpus Javensis*, Bl. Bijdr. 527; Fl. Jav. Cup. 35. t. 20; Miq. Fl. Ind. Bat. i. pt. 1. 865; Ann. Mus. Lugd. Bat. i. 118; Oudem. Annot. Crit. Cup. Javan. 19. t. 11.—*? Q. varingæfolia*, Miq. in Pl. Jungh. i. 12.

Mountains of Western Java,—*Blume, Junghuhn, Forbes;* Sumatra,—*Beccari* (*P.S.* 75); at elevations of 4,000 to 5,000 feet.

A tree, 80 to 130 feet high. In its leaves and male flowers this resembles *Q. Wenzigiana*, King, and *Rassa*, Miq.; but the leaves of this are much thicker, and the fruit of course differs widely. Miquel himself (*Fl. Ind. Bat. i. pt.* 1. 865) reduces his own species *Q. varingæfolia* here. The only specimens of the latter which I have seen are leafy branches collected by Junghuhn in Java (*Herb. Jungh.* No. 11), and they are certainly quite different from *Q. Javensis*, Bl., but there may have been some changing of labels.

PLATE 76B.—*Q. Javensis*, Miq. 3, branch with androgynous inflorescence; 4, spike with female flowers (*from Oudemans*); 5, young acorn; 6, side view of half ripe acorn; 7, ripe acorn,—*all of natural size.*

79. QUERCUS XYLOCARPA, *Kurz in Journ. As. Soc. Bengal*, 1875, *pt.* 2. 196, *t.* xiv. *figs.* 5 *to* 8.

Young branches fuscous, puberulous. *Leaves* thinly coriaceous, narrowly elliptic-oblong or oblong-acuminate, entire; the base acute; main nerves about 12 pairs, thin but rather prominent beneath; glabrous on both surfaces, glaucescent on the lower; length of blade 4 to 8 in., breadth 1·75 in. to 2 in.; petiole stout, under ·5 in. Ripe fruit on short, stout, axillary spikes; the *cupules* entirely connate into irregular masses of three, one or more of which may be abortive; the entire glans encased in the depressed-globose, woody cupule which is covered by hard, striate, conical tubercles or spines, which sometimes have their apices produced into spreading or reflexed points. *Glans* closely invested by the cupule and with difficulty separated from it, turbinate, crowned by the remains of the styles, smooth, about ·75 in. in diameter; masses of connate cupules 2 in. in diameter or more.—*Kurz For. Flora Burmah* ii. 489; *Hook. fil. Fl. Br. Ind.* v. 618.

Assam,—*Jenkins* (acorn only); Kupra, on the Munipore Frontier, at elevations of from 6,000 to 7,000 feet,—*G. Watt;* Garo Hills, *Fisher;* Kohima, at 6,500 feet,—*C. B. Clarke, D. Prain;* Burmah (*fide* Kurz), east of Akyab, at an elevation of 4,000 to 5,000 feet.

In Assam this occurs as a gregarious tree or grows mixed with *Q. lamellosa* (*fide* Prain). Of this species, a single mass of fruit without leaves was sent to the Calcutta Herbarium many years ago by Colonel Jenkins, then Commissioner of Assam. On these acorns Kurz founded the species, but it was not until Dr. Watt visited Munipore in 1882 that its leaves were known. Male and female flowers are still desiderata. According to Kurz, the cupule opens transversely when ripe, and the glans becomes exposed; but I have seen no evidence of this.

PLATE 79.—*Q. xylocarpa*, Kurz. 1, branch with two leaves; 2, spike of nearly ripe fruit; 3 & 4, fruiting-spikes, with an involucre partly removed to show the glans,—*all of natural size;* 5, scales of cupule: *enlarged.*

80. QUERCUS TRUNCATA, *King in Hook. fil. Fl. Br. Ind.* v. 618.

All parts, except the inflorescence, glabrous. *Leaves* ovate-lanceolate to oblong-lanceolate, acuminate, entire, gradually narrowed from the middle into the rather long, slender petiole; main nerves 9 to 12 pairs, rather prominent below; both surfaces glabrous—the upper shining, the lower dull, pale; length of blade 5 to 8 in., breadth 1·75 in. to 3 in.; petiole about ·65 in. *Spikes* solitary, axillary, or in small terminal panicles; the female spikes few and below the male, all with pubescent rachises. *Male flowers* in glomeruli of 4 to 8; each glomerulus with long subulate bracteoles; perianth with 6 blunt lobes, tomentose outside; stamens 8 to 10. *Female flowers* in glomeruli of 3 or more; the styles erect, sub-divergent. *Ripe fruit* on a stout, puberulous, lenticellate rachis of about the length of the leaves. *Cupules* woody, sessile, sub-infundibuliform at first, afterwards sub-hemispheric; at all ages completely surrounding all parts of the glans except its flat truncate apex; the scales broadly ovate, abruptly acuminate, adpressed; the lower smooth, completely connate; the upper striate; their apices free, numerous and much imbricate. *Cupules* of each glomerulus connate by their bases, or in twos, or solitary by abortion. *Glans* depressed-ovoid, sericeous, enclosed in the cupule except the flat apex, in the middle of which stand the remains of the united bases of the styles.

Assam; Naga Hills; at Piphema, at 2,000 feet,—*Collett;* Pulina Badza near Kohima, —*Watt, Prain, Clarke;* common at elevations of 2,000 to 6,000 feet.

A very distinct and handsome species, at once distinguished by its fruit.

PLATE 80.—*Q. truncata,* King. 1, flowering branch; 2 & 3, clusters of half-ripe fruits; 4, ripe fruits, solitary by abortion,—*of natural size;* 5, male flower: *enlarged.*

81. QUERCUS ROTUNDATA, *Bl. in Batav. Verh.* ix. 219.

Young shoots glabrous. *Leaves* coriaceous, oblong or oblong-lanceolate, acuminate, entire; the base acute or obtuse; main nerves 9 or 10 pairs, prominent; length of blade 4 to 6 in., breadth 1·5 to 2 in.; petiole ·75 in.; adult leaves glabrous above, glabrescent-glaucescent beneath; stipules linear-pubescent. *Spikes* androgynous; the females below, terminal or axillary, solitary or in fascicles of 2 or 3. *Male flowers* glomerulate. *Ripe fruit* in short, stout spikes. *Cupules* shortly pedunculate, sub-hemispheric or broadly campanulate, woody; the scales in the lower two-thirds completely connate; their apices obsolete; in the upper third broadly ovate-apiculate, the free apices minute; glans obconic; its upper part (apex) almost flat, faintly striate, sub-glabrous, scarcely projecting above the edge of the cupule; the remains of the united styles forming a short point in its centre.—*Bl. Bijdr.* 521; *Flor. Jav. Cupul.* 22. *t.* 11; *Mus. Bot. Lugd. Bat.* i. 294; *Miq. Fl. Ind. Bat.* i. 852; *Ann. Mus. Lugd. Bat.* i. 110; *DC. Prod.* xvi. ii. 288; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 239.

Western Java,—*Blume.*

A species related to *Q. cornea,* Lour., by its remarkable truncate obconic fruit, but distinguished from *cornea* by its leaves, and by other characters.

PLATE 100A.—*Q. rotundata,* Bl. 1, branch with spikes; 2 & 3, ripe acorns,—*of natural size.*

82. QUERCUS PULCHRA, *nov. spec.*

Smaller branches striate, minutely but rather densely fulvous or fuscous-tomentose. *Leaves* coriaceous, oblong-lanceolate to elliptic-oblong, shortly and rather suddenly acuminate, entire; the base acute or acuminate; main nerves 8 to 16 pairs, bold and prominent beneath, sub-obsolete above; both surfaces of the young leaves, but especially the lower, lepidote-pubescent; adult leaves with the upper surface (except the midrib and nerves) glabrous and shining; lower surface pale, minutely stellate-tomentose; the midrib, nerves, and petiole dark-coloured and pubescent; length of blade 5·5 to 8·5 in., breadth 2·25 to 3·25 in.; petiole ·6 in. *Spikes* mostly male, short, in crowded terminal panicles; the rachises minutely fulvous-pubescent. *Male flowers* in glomeruli; the perianth with 6 acute teeth; anthers about 12. *Female flowers* on spikes which bear a few male flowers towards the apex, solitary, bracteolate ; the styles sub-divergent. *Ripe fruit* in stout spikes much longer than the leaves. *Cupules* woody, solitary, sessile, infundibuliform, embracing the whole of the glans except its broad, flattened, sub-concave apex, 1·25 in. in diameter and ·8 in. deep; the scales connate by their bodies; the stout, conical, rugose apices alone free, and most numerous towards the upper edge. *Glans* strongly adherent to the cupule, obconic, the apex flat, sub-concave, broad, minutely tawny-sericeous.

Sarawak in Borneo,—*Sig. Beccari* (*Herb. Becc. Nos.* 2100, 3123, 3169).

A very fine species, readily distinguished by its handsomely sculptured cupules. The pubescence on the smaller branches is not deciduous, but becomes darker with age.

PLATE 81.—*Q. pulchra*, King. 1, branch with acorns in various degrees of ripeness; 2, male spikes. 3, female spike,—*of natural size;* 4 & 5, male flowers; 6 & 7, female flowers: *enlarged.*

QUERCUS.

SPECIES DOUBTFUL OR IMPERFECTLY KNOWN.

Lithocarpus ? angustifolius, *Miq. Fl. Ind. Bat.* i. 1. 352; *DC. Prod.* xvi. ii. 104.

This name was given by Miquel to some leaf specimens from Sumatra. He subsequently, however (*Ann. Mus. Lugd. Bat.* i. 118), declared the species as too doubtful to be kept up. The original specimens (which I have examined) may possibly belong to some genus of *Laurineæ;* they have certainly not a Cupuliferous *facies*.

Quercus crassinervia, *Bl. Mus. Bot. Lugd. Bat.* i. 292; *DC. Prod.* xvi. ii. 87.—*Q. pseudo-Molucca*, Bl., var. *crassinervia*, Miq. Fl. Ind. Bat. i. 849; Ann. Mus. Lugd. Bat. i. 109; Wenzig in Jahrb. Bot. Gart. Berl. iv. 227.

A species very poorly represented in the Leiden Herbarium, and by a single specimen with leaves and young fruit (received from Leiden) in M. De Candolle's collection at Geneva. Very possibly Miquel and Wenzig may be right in considering this a form of *pseudo-Molucca;* but the material is, I think, too scanty to form an opinion upon. The specimens bearing this name at Leiden were collected by Van Hasselt in Mount Kendang in Western Java.

Quercus cyrtopoda, *Miq. Fl. Ind. Bat.* i. 869; *DC. Prod.* xvi. ii. 97.

A species from Sumatra very poorly represented in collections. The best specimen which I have seen is from Buitenzorg (*Herb. Hort. Bogor.* 2228), and this has not the fruit attached. In its leaves this specimen resembles *Q. Lamponga*, Miq. It also resembles *Q. cyrtorhyncha*, Miq., but the loose fruit associated with the leaves differs from that of *cyrtorhyncha* in having the glans depressed tomentose.

Quercus ? divaricata, *Lindl. in Wall. Cat.* 2790.

Young shoots thin, sparsely and deciduously furfuraceous-pubescent; all other parts, except the inflorescence, glabrous. *Leaves* membranous, oblong-lanceolate, acute, or shortly acuminate, entire; the base acute; both surfaces smooth and shining, glabrous, except the midrib which on the lower surface is adpressed-puberulous; the reticulations minute, but distinct; nerves 9 to 10 pairs, thin, but prominent beneath; length of blade 3·5 to 4·5 in., breadth 1·2 to 1·5 in.; petiole ·25 in., thin. *Spikes* minutely cinereous-tomentose, solitary and axillary, or in a short, rather dense, terminal panicle. *Male flowers* glomerulate; female flowers (*fide* De Candolle) at the base of some of the male spikes, ovoid. Fruit unknown.—*DC. Prod.* xvi. ii. 105; *sp. dub.*, *Hook. fil. Fl. Br. Ind.* v. 618.

Lower Burma at Tavoy,—*Wallich.*

This species is known only from Wallich's specimens, few of which have female flowers, and none of which have fruit In foliage the specimens approach *Castanopsis rhamnifolia*, DC., to which species Kurz indeed referred them.

QUERCUS GEMELLIFLORA, *Bl. Batav. Verh.* ix. 222. *t.* 6; *Bijdr.* 523; *Flor. Jav. Cupul.* 30. *t.* 17; *Mus. Bot. Lugd. Bat.* i. 295; *Miq. Fl. Ind. Bat. Suppl.* i. 854; *Ann. Mus. Lugd. Bat.* i. 111; *DC. Prod.* xvi. ii. 88; *Wenzig in Jahrb. Bot. Gart. Berl.* iv. 228.

A species from the mountains of Western Java and of Sumatra, described and figured by Blume as having narrowly lanceolate, acuminate leaves, serrate in the upper half, entire and much attenuate towards the base, deciduously tomentose; the cupules solitary, or connate in pairs, hemispheric, with adpressed, ovate scales in the upper half (the scales obsolete in the lower half), and an ovoid-conic glans much longer than the cupule. The type specimens of this at Leiden (received from the Buitenzorg Herbarium) consist of leaf-twigs only, with neither flowers nor fruit. M. De Candolle's specimen (received from Leiden) is no better. The leaves of *gemelliflora*, as described and figured by Blume, are extremely like those of his *Q. turbinata*, but the acorns of this are those of a *Pasania* (*turbinata*, Bl., being a *Cyclobalanus*).

QUERCUS GLUTINOSA, *Bl. Mus. Bot. Lugd. Bat.* i. 304; *Miq. Fl. Ind. Bat.* i. 1. 861; *Ann. Mus. Lugd. Bat.* i. 118; *DC. Prod.* xvi. ii. 106.

A species described by Blume from leaves only, and now represented in the Leiden collection by a leaf-twig which Miquel suggests may be a sterile shoot of *Q. induta.* M. De Candolle, however, considers this doubtful, and I quite agree with him.

QUERCUS GRACILIS, *Korth. Verh. Nat. Gesch.* 207; *Blume Mus. Bot.* i. 300; *DC. Prod.* xvi. ii. 93; *Miq. Fl. Ind. Bat.* i. 861; *Ann. Mus. Lugd. Bat.* i. 113.

Bornean specimens without fruit in the Leiden Herbarium form the material on which this species was founded. I have seen nothing quite like them in any other collection except No. 11472 ex Herb. Hort. Bogor. in Signor Beccari's Herbarium. This species is put into *Cyclobalanus* by M. De Candolle.

QUERCUS JENKINSII, *Benth.*, *in Hook. Ic. Pl. t.* 1312, 3; *sp. dub.*, *Hook. fil. Fl. Br. Ind.* v. 618.—See remarks under *Q. Listeri*, mihi.

QUERCUS LEPTOGYNE, *Korth. Verh. Nat. Gesch.* 206; *Blume Mus. Bot.* i. 301; *Miq. Fl. Ind. Bat.* i. 1. 861; *Ann. Mus. Lugd. Bat.* i. 108; *DC. Prod.* xvi. ii. 93.

The author of this species does not describe the fruit, and his type specimen in the Leiden Herbarium has none. It was collected in Borneo, from whence, let us hope, better material may some day be forthcoming. At present it is a doubtful species. M. De Candolle puts it in *Cyclobalanus*, while Miquel (l c.) suggests that it may be a *Castanopsis*.

QUERCUS LISTERI, *King; sp. dub. in Hook. fil. Fl. Br. Ind.* v. 618.

Young branches minutely pulverulent-tomentose; the older with pale, lenticellate bark. *Leaves* coriaceous, elliptic-oblong, acuminate, entire; the base acute; upper surface glabrous, shining; the lower paler, very minutely tomentose; main nerves 9 to 12 pairs, rather prominent below; length of blade 10 to 14 in., breadth 4 to 6 in.; petiole 1·3 in. to 2 in. *Male flowers* in erect, narrow, pale, tomentose, axillary and terminal panicles shorter than the leaves. *Female spikes* solitary, axillary, shorter than the leaves; flowers in glomeruli of 3; the involucres with many, rather narrow, tubercles; styles short, exserted. Ripe fruit unknown. *Quercus Jenkinsii*, Benth. in Hook. Ic. Pl. as regards t. 2313 only.

Assam, Nanmoo, and Sudya,—*Griffith* (4464); Mishmee,—*Griffith* (4472); Makum Forest,—*Brandis;* Dufla Hills,—*Lister* (340); Upper Dehing Forest,—*G. Mann.*

The acorn of this is unknown, and I would not have described the species but for the fact that the leaves and male inflorescence, as characterised above, were figured by the late Mr. Bentham (*Hooker's Icones t.* 1313) as part of the materials on which he founded his species *Q. Jenkinsii.* On carefully examining them, I am driven to the conclusion that these materials do not all belong to the same plant. They consist of three sets of things—(1) Griffith's Assam specimens with leaves and male inflorescence (Sudya and Nanmoo, No. 4464, and Mishmi, No. 4472, *Kew Distrib.*); (2) Griffith's Burmese specimens (banks of Mogoung, No. 4460, and Lamone, No. 4463, with perhaps the Wallichian sheet 9145). These have leaves and spikes with young fruit. The leaves taper much less and have shorter petioles than the former set; (3) loose acorns in a bottle, bearing on a label in Griffith's handwriting the words "*Castanea*, No. 122, Major Jenkins, October 1843." The first and second of these do not, in my opinion, belong to one, but to two species. The loose acorns may belong to either of these two, or to a third of which no other parts have yet been collected. Mr. Bentham published in the *Icones Plantarum* two figures of *Q. Jenkinsii*, viz. Ic. 1313, on which the Assam (male) plant is figured (and it is for this which I now propose the name *Q. Listeri*); and Ic. 1312, on which the Burmese (female) plant is figured, together with two of Jenkins's loose acorns. For the latter the name *Q. Jenkinsii*, Benth., may be retained; but, pending the receipt of fuller sets of specimens, the species must, I think, be considered a doubtful one.

The female spike, which I now figure and describe as that of *Q. Listeri*, was collected by Sir D. Brandis in Assam. The leaves attached to the spike are quite the same as those of Griffith's Nos. 4464 and 4472; but the spike differs from that figured by Mr. Bentham for *Q. Jenkinsii*, inasmuch as the latter shows the flowers as solitary.

PLATE 82.—*Q. Listeri*, King. 1, leaf and male inflorescence from Griffith's No. 4464; 2, female flower-spike and leaf from Brandis's specimen,—*of natural size.*

QUERCUS LITTORALIS, *Bl. Mus. Lugd. Bat.* i. 303; *Miq. Fl. Ind. Bat.* i. 1. 864; *Ann. Mus. Lugd. Bat.* i. 118; *DC. Prod.* xvi. ii. 106.

This species is represented in the Leiden Herbarium by a single leaf-twig. Miquel (l.c.) suggests that it may be a form of *Q. spicata*, Sm.

QUERCUS MIXTA, *DC. Prod.* xvi. ii. 83; *sp. dub. in Hook. fil. Fl. Ind.* v. 619.

Mixed with Wallich's specimens of *Q. Amherstiana*, and bearing the same number (2783), are fragments of at least one, if not of two, other species. These fragments consist of (*a*) *leafy specimens bearing androgynous spikes.* These (in Herb. Calc.) are in my opinion *Q. spicata*, Sm., or something very near it; (*b*) *male spikes, quite separate from any twig.* I do not know what these are, but they are not the same as the spikes of (*a*); (*c*) *fruiting peduncles truncate at the apex* (*as if the part bearing the male flowers had withered off*) *and scooped out at the insertions of the cupules; the cupules small* (·25 *in. high and from* ·35 *in. to* ·5 *in. across*), *open, connate by their bases into fascicles; their scales ovate-acute, sub-connate.* Along with these cupules there is a note in Wallich's handwriting—"an 2789 Taong Doung?" Now, Wallich's No. 2789 is *Q. polystachya*, Wall., a tree still found growing in Burmah and Penang.

I fear, however, that the mixture in Wallich's distribution of his No. 2783 has been by no means a uniform one, and that, in different sets of his plants, different species have been mixed. M. De Candolle has accepted the fragments which I have here called (*a*) and (*c*) as belonging to one plant, and a description of these forms the basis of his species *Q. mixta*.

Since writing the foregoing, I have examined some collections recently made by the Collector of the Calcutta Botanic Garden in the Chittagong Hill Tracts; and in them I find numerous specimens of a *Quercus* answering fairly with M. De Candolle's description of *mixta*, and agreeing with that part of Wallich's material which I have designated (*a*). These specimens form, in my opinion, a variety of *Q. spicata*, and I have named it var. *Chittagonga*.

QUERCUS MOLUCCA, *Rumph. Hort. Amb.* iii. 85 (*partly*) *t.* 56.

Rumph's rude figure and description having been associated with some loose leaves and young fruit of a *Quercus* in the Leiden Herbarium (received from the Moluccas and Celebes), this species was published in Willdenow's edition of Linnæus' *Spec. Pl.* iv. 1. 427, and was kept up by Sprengel (*Syst.* iii. 857), and Blume (*Mus. Bot.* i. 291), and also by Smith (*Rees' Encycl.* v. 29. No. 11).

Blume, however, omitted it from his *Bijdragen* and *Fl. Javæ. Cupulif.* M. De Candolle admits it in the *Prodromus* xvi. ii. 86, but mentions that his material consists of a single leaf and a young fruit (from Celebes) sent to him by Blume. The type specimen of the species in the Leiden collection is of the same meagre sort, and I have seen nothing bearing the name in any other collection. Miquel keeps up the species in his *Fl. Ind. Bat.* i. 849. I think it probable that the species has been described from fuller material under some other name.

QUERCUS NITIDA, *Bl. Mus. Lugd. Bot.* i. 294; *Miq. Fl. Ind. Bat.* i. 857; *DC. Prod.* xvi. ii. 95.

Of this species Blume never saw ripe fruit. His description of the cupules refers to a few very young ones on the scanty materials (3 shoots) at Leiden collected by Korthals in Sumatra. The *leaves* are glabrous, elliptic-oblong, shortly cuspidate, very smooth and shining on the upper, and pale, glaucescent, minutely reticulate on the lower surface. The *cupules* are hemispheric, passing below into very thick, scaly pedicels. They have numerous, rather large, tubercular scales, and look more like those of a *Pasania* than of *Cyclobalanus*, in which section M. De Candolle places the species. Dr. Wenzig, in his paper on the Oaks of Eastern and Southern Asia in *Jahrb. Bot. Gart. Berl.* iv. 235, gives a description of the mature fruit of this species, and, as an example of it, he quotes H. O. Forbes' Sumatra Herbarium No. 1683. But that specimen of Forbes' does not agree with Blume's fragmentary type at Leiden; and if Dr. Wenzig's description is founded on it he has, I fear, mixed up two quite distinct plants.

QUERCUS OLIGONEURA, *Korth. in Verh. Nat. Gesch. Bot.* 203; *Bl. in Mus. Bot. Lugd. Bat.* i. 294; *Miq. Fl. Ind. Bat.* i. 853; *Ann. Mus. Lugd. Bat.* i. 109; *DC. Prod.* xvi. ii. 88.

A species collected by Korthals near Doekoe in Sumatra. This has large (6 to 9 in. long by 2 to 4 in. broad) oval or oval-oblong leaves, of a very pale colour, and with few (6 or 7 pairs) of lateral nerves. The only fruits attributed to this species are quite immature, and they are separate from the leaves. The leaves are undistinguishable from those of *Q. Eichleri*, Wenzig, and I think it highly probable that Wenzig's plant is really what Korthals meant by *Q. oligoneura;* but Korthals did not describe the fruit, and his species must be treated as doubtful.

QUERCUS OLLA, *Kurz in Journ. As. Soc. Beng. for* 1875, *pt.* 2. 197; *spec. dub. in Hook. fil. Fl. Ind.* v. 619.

Adult twigs with smooth, dark-coloured bark. *Fruit spikes* stout, 4 in. long. *Cupules* distinct, with 1 or 2 abortive adnate to the base, sub-turbinate, 1 in. in diameter and about ·5 in. deep, very thick-walled, woody, minutely fulvous-tomentose, with numerous rows of broad shortly and abruptly acuminate scales. *Glans* depressed-globose, covered by the cupules except at the broad flat apex, smooth, shining.

Assam,—*Jenkins.*

The only specimen of this consists of a spike of ripe fruit collected in Assam many years ago by the late Colonel Jenkins, Chief Commissioner of that province. There are no leaves on this specimen, and no other has ever been received from Assam or any part of India. The acorns are very peculiar and very handsome; and were the tree at all a common one, they could hardly have failed to attract the attention of the many planters scattered over the province. Possibly, therefore, Colonel Jenkins may have collected his solitary specimen during some expedition beyond the British frontier.

QUERCUS OOGYNE, *Miq. Fl. Ind. Bat. Suppl.* 351; *Miq. in Ann. Mus. Lugd. Bat.* i. 113; *DC. Prod.* xvi. ii. 95.

The materials on which Miquel founded this species include no ripe fruit. They consist of some specimens (without flowers and in very young fruit) sent to the Utrecht Herbarium from Buitenzorg (*Herb. Hort. Bogor. No.* 1315). The leaves are elliptic-lanceolate, acuminate, of a purplish-brown, pale beneath when dry, and the very young cupules have large thick scales. Whether these scales become united into lamellæ with age, or whether they remain distinct, cannot be determined from the specimen. De Candolle, however, puts the species into *Cyclobalanus.*

The material is in my opinion too scanty, and until more shall be forthcoming, I think this species should be kept in abeyance. These Utrecht specimens a good deal resemble the fragmentary type of *Q. nitida*, Bl., at Leiden. Miquel says the leaves resemble those of *argentata* and *encleisocarpa.*

QUERCUS PINANGA, *Bl. Mus. Lugd. Bat.* i. 303; *DC. Prod.* xvi. ii. 107; *Miq. Fl. Ind. Bat.* i. 864; *Ann. Mus. Lugd. Bat.* i. 107, 118.

A species originally described by Blume, who had never seen its fruit. It is now represented at Leiden by two leaf-specimens which may or may not belong to a Cupulifer. Miquel (l.c.) suggests that they may be from a cultivated specimen of *Q. glabra,* Thunb.

QUERCUS PLUMBEA, *Bl. in Mus. Bot. Lugd. Bat.* i. 293; *Miq. Fl. Ind Bat.* i. 852; *Ann. Mus. Lugd. Bat.* i. 108; *DC. in Prod.* xvi. ii. 88.

The material of this at Leiden is very poor, and the specimen in M. De Candolle's Herbarium, consisting only of four leaves and young fruit, is no better. It is said to be a Sumatra species, collected by Korthals. From Blume's description of this, it must resemble *pruinosa* in its furfuraceous-lepidote vestiture, but the leaves are said to be narrowed and more elongated than in that species. The only fruit known is very young.

QUERCUS SPHACELATA, *Bl. Mus. Bot. Lugd. Bat.* i. 304.

A species described from leaves which are still present in Blume's Herbarium in Leiden. M. De Candolle suggests that they are Euphorbiaceous.

QUERCUS URCEOLARIS, *Jack Mal. Misc. in Hook. Comp. Bot. Mag.* i. 256; *DC. Prod.* xvi. ii. 89.

This is known only from Jack's imperfect description. Miquel suggests (*Ann. Mus. Lugd. Bat.* i. 109) that it may be *Q. Lamponga*, Miq.

Sir Joseph Hooker observes (*Fl. Br. Ind.* v. 619) that two numbers of Wallich's Catalogue, named doubtfully as *Antidesma*, are really *Querci* in young flower, but specifically indeterminable. These are No. 9144 Herb. Finlayson and No. 9145 from Tavoy.

In the Kew Herbarium there is a drawing of a fine species of *Quercus* presumed to be Malayan and attributed to a Mr. Parry. The leaves of this are elliptic-oblong, cuspidate, 12 in. long by 5·5 in. broad; the cupules are sessile, shallow, 2 in. wide, with reflexed, corrugated edges; the nuts are sub-spheroidal, 1·25 in. in diameter, with concave base and slightly convex, apiculate top.

CASTANOPSIS, Spach in Suit. Buff. xi. 185.

Habit and character of Quercus, *Sect.* Chlamydobalanus, *except that the fruiting-involucre is more or less spiny or tubercular externally, often splits irregularly, and contains 1 to 4 nuts.*

Fruit ovoid or globose (sometimes transversely elongate in No. 11); the involucre dehiscent, spiny.

- Walls of involucre completely hidden by subulate spines.
  - Leaves pubescent or minutely tomentose on the lower surface.
    - Edges of leaves serrate at all ages.
      - Leaves rufous beneath; nerves 14 to 16 pairs . . . . 1. *C. Indica.*
      - „ pale beneath; nerves 10 to 12 pairs . . . . 2. *C. Clarkei.*
    - Edges of leaves serrate when young, sometimes entire when adult; nerves 7 to 9 pairs . . . . 3. *C. hystrix.*
    - Edges of leaves entire.
      - Leaves distinctly dimorphous . . . . 4. *C. diversifolia.*
      - Leaves not dimorphous.
        - Leaves ovate-oblong to obovate-oblong, with 11 to 15 pairs of tomentose nerves . . . . 5. *C. Motleyana.*
        - Leaves elliptic-oblong to elliptic, with 12 to 16 pairs of nerves; olivaceous when dry . . . . 6. *C. Tungurrut.*
        - Leaves ovate-lanceolate or oblong-lanceolate, with 9 to 12 pairs of nerves; under surface rufous or cinnamoneous . 7. *C. Javanica.*
  - Leaves glabrous on both surfaces (or very minutely pubescent beneath in *Catappæfolia*).
    - Leaves 4 to 8·5 in. long, lanceolate, oblanceolate to elliptic-lanceolate, glaucous beneath . . . . 8. *C. argentea.*
    - Leaves less than 4 in. long, lanceolate, not glaucous . . . . 9. *C. Borneensis.*
    - Leaves ovate-oblong or obovate-oblong, not more than 12 in. long; involucre ovoid, 1·25 in. long, nut single . . . . 10. *C. castanicarpa.*
    - Leaves oblanceolate, 18 to 20 in. long; involucre sub-globose or transversely oblong, obscurely angled, 1·5 in. to 2 in. in diameter . . 11. *C. Catappæfolia.*

Walls of involucre bearing spines in tufts or ridges, but not completely hidden by them.

Spines in tufts, leaves glabrous, entire . . . . 12. *C. argyrophylla.*

Spines in ridges.

Leaves glabrous, entire . . . . 13. *C. armata.*

Leaves with cinereous or ferrugineous pubescence beneath, entire or serrate towards the apex . . . . 14. *C. tribuloides.*

Fruit sub-globose to sub-ovoid, more or less depressed, sometimes obscurely angled; walls of involucre bearing transverse tuberculate zones; nuts usually more than one.

Leaves thinly coriaceous, with 10 to 12 pairs of nerves; involucre without vertical grooves, its transverse ridges faintly tuberculate, dehiscing irregularly or not at all . . . . 15. *C. Sumatrana.*

Leaves coriaceous, with 16 to 20 nerves; grooved vertically and with 3 or 4 very prominent, wavy, tuberculate, horizontal zones, dehiscence 4-valvular 16. *C. Hullettii.*

Fruit sub-globose, complanate, indehiscent; involucre inseparable from the solitary glans, the flat surface smooth; the rest of the exterior with short prismatic or patelliform spines or tubercles, or with interrupted vertical ridges.

Fruit with prismatic spines.

Leaves glabrous on both surfaces.

Leaves coriaceous, elliptic-lanceolate, with 7 to 9 pairs of nerves; nuts 1 to 3, ovoid, complanate . . . . 17. *C. Schefferiana.*

Leaves thinly coriaceous, ovate-elliptic or elliptic-oblong, with 7 to 8 pairs of nerves; nut solitary . . . . 18. *C. rhamnifolia.*

Leaves flocculent, pubescent beneath, coriaceous, lanceolate or ovate-lanceolate, with 6 to 7 pairs of nerves; nuts solitary . . . . 19. *C. Wallichii.*

Fruit with patelliform tubercles; leaves minutely furfuraceous, pubescent beneath 20. *C. nephelioides.*

Fruit with interrupted vertical ridges . . . . 21. *C. Curtisii.*

Species of which the ripe fruit is unknown . . . . 22. *C. Buruana.*

1. CASTANOPSIS INDICA, *A. DC. in Seem. Journ. Bot.* i. (1863) 182; *Prod.* xvi. ii. 109.

Young shoots, under surfaces of leaves at all ages, petioles and inflorescence minutely rusty-tomentose or pubescent. *Leaves* elliptic-oblong, acute or shortly acuminate, sharply but remotely serrate in the upper three fourths; the base entire, obtuse, rarely acute; upper surface shining, glabrous, except the pubescent midrib; nerves 14 to 16 pairs, prominent beneath; length of blade 4 to 8 in., breadth 1·75 to 3 in.; petiole ·25 in. *Male spikes* in lax, terminal or axillary panicles longer than the leaves; flowers glomerulate; perianth 6-partite; stamens 12. *Female spikes* axillary, solitary, longer than the leaves; flowers solitary. *Ripe involucres* about 1 to 1·5 in. in diameter, densely covered with straight, simple, unequally long, radiating, subulate, adpressed-pubescent prickles, the longest of which measures nearly ·5 in. *Nut* ovoid, ·25 to ·5 in. long.—*Miq. Ann. Mus. Lugd. Bat.* i. 119; *Brandis For. Flora* 490; *Gamble Ind. Timb.* 388; *Hook. fil. Fl. Br. Ind.* v. 620.—*Castanea indica,* Roxb. Fl. Ind. iii. 643; Blume Mus. Bot. Lugd. Bat. i. 284; Wight Ic. 417; Kurz For. Flor. Burm. ii. 478; Wall. Cat. 2761.—*Q. serrata,* Roxb. Fl. Ind. iii. 641 (not of Willd.).—*Q. dubia,* Lindl. in Wall. Cat. 2786.

Himalaya, at elevations up to 4,000 feet, from Nepal to Bhotan, very common, especially between 1,000 and 3,000 feet; Assam Range; Chittagong Hills.

PLATE 83.—*C. indica*, A. DC. 1, flowering-branch; 2, spike of young fruit; 3, spike of nearly ripe fruit,—*of natural size.*

2. CASTANOPSIS CLARKEI, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Branchlets minutely tomentose when young, afterwards glabrous. *Leaves* elliptic-oblong or lanceolate, rarely oblanceolate, acute or acuminate, coarsely serrate almost to the base, pale and puberulous beneath; upper surface dull, glabrous; nerves 10 to 12 pairs; length of blade 3·5 in. to 4·5 in., breadth 1·5 in. to 1·75 in.; petiole ·3 in. *Male spikes* in lax, scanty, slender panicles about as long as the leaves, rufous-pubescent. *Female spikes* slender, solitary. Ripe involucres ovoid, about 1 in. long, densely covered with long, slender, weak, rather straight, rufous-pubescent spines. *Nuts* broadly ovoid, solitary, deciduously adpressed-pubescent.

Bhotan-Himalaya, at Kalimpong, altitude 5,000 feet,—*Clarke;* Shan Hills, Burmah,—*Collett.*

This species has been collected only by Mr. C. B. Clarke and General Collett. It forms a connecting link between *C. indica* and *C. tribuloides*, var. *ferox.* The pale pubescent under surfaces of the leaves and the slender inflorescence are its best diagnostic marks.

PLATE 83 BIS.—*C. Clarkei*, King. 1, branch with panicle of male flowers; 2 & 3, spikes of young fruit; 4, mature fruit,—*all of natural size.*

3. CASTANOPSIS HYSTRIX, *A. DC. in Seem. Journ. Bot.* i. (1863) 182; *Prod.* xvi. ii. 111.

Young shoots and rachises of inflorescence rufous-pubescent. *Leaves* coriaceous, lanceolate or oblong-lanceolate, acuminate, remotely serrate in the upper three-fourths, sometimes entire when old; the base obtuse or sub-acute; upper surface glabrous; the under densely covered with minute ferruginous, flocculent tomentum, often glabrescent when old; nerves 7 to 9 pairs (10 to 13 in Malayan specimens), bold and prominent on the lower, impressed on the upper surface; length of blade 3 to 5 in., breadth 1·6 in. to 2 in.; petiole about ·5 in.; spikes stout, sub-pendulous or spreading, in small sub-terminal or axillary panicles; the male numerous, the female spikes few. *Females flowers* in threes, covered by numerous small, scarious, pubescent bracteoles. *Ripe involucres* more or less 4-angled, about 2 in. across (1 to 1·5 in. in Malayan specimens); the involucre thick-walled, densely covered with simple or branching, interlacing, subulate, rigid, straight spines, from ·25 to nearly ·5 in. long, with pubescent bodies, but with glabrous points. *Nuts* 3, 2, or sometimes only 1 (by abortion), ovoid-conic, more or less 3-angled, sub-adpressed-pubescent (the hairs retroversed), about ·5 in. long.—*Miq. Ann. Mus. Lugd. Bat.* i. 119; *Hook. fil. Fl. Br. Ind.* v. 620.—*Castanea hystrix* and *rufescens*, Hook. fil. and Thoms. MSS.

Sikkim Himalaya, at elevations of from 5,000 to 8,000 feet, common; Khasia Hills, at elevations of from 2,000 to 3,000 feet,—*Griffith* (4445), *Hooker;* Perak, at elevations of 4,500 to 4,600 feet,—*King's Collector* (6975 and 7751).

This bears a considerable resemblance to some of the forms of *C. tribuloides*, DC. with ferruginous pubescence, but is distinguished from them by its female flowers being in threes and (in the Indian specimens) by the involucres containing more than one nut; also by the flocculent pubescence of the under surface of its leaves. In Sikkim this rarely grows below 6,000 feet, and never so low as *echidnocarpa* and *armata* (the ferruginous varieties of *tribuloides*). The only specimens from the Khasia Hills which I have seen were collected by Griffith (No. 4445) and by Sir J. D. Hooker. Recent collections from the Khasia (*e.g.*, Mr. Gustav Mann's) do not contain this species. The species appears to be rather common at elevations of from 4,500 to 5,000 feet in the central chain of hills which forms the backbone of the Malayan Peninsula. Specimens from thence have entire leaves and rather smaller fruits than Himalayan specimens; and the fruits, moreover, often contain only one nut. The Malayan trees may, however, possibly belong to a different species.

PLATE 84.—*C. hystrix*, A. DC. 1, branch with inflorescence of one female and many male spikes; 2. branch with spike of immature fruit; 3, ripe fruit,—*all of natural size;* 4, male flowers, *enlarged.*

4. CASTANOPSIS DIVERSIFOLIA, *King in Hook. fil. Fl. Br. Ind.* v. 620.

Young shoots minutely fulvous-tomentose. Adult *leaves* coriaceous, varying in shape on the same branch from oblong, ovate-oblong to broadly elliptic, sometimes oblique; the apex acute in the narrower forms, blunt but mucronate in the broader; upper surface glabrous when adult; under surface puberulous to glabrous; the midrib and nerves sometimes puberulous on both surfaces; nerves 10 to 15 pairs, stout, prominent beneath; secondary nerves bold, transverse; length of blade 4·5 to 9 in., breadth 2 to 5 in.; petiole ·25 to ·75 in., stout, tomentose. *Male flowers* in robust, spreading, terminal, tomentose panicles. *Fruit* sessile, globular; the involucre indistinctly ridged and densely covered with simple, sharp, stout, pubescent, radiating spines, about ·4 in. long. *Nut* single, depressed-globular, adpressed-pubescent, ·5 in. long and ·75 in. broad.—*Castanea diversifola*, Kurz. For. Flora Burmah ii. 479; Journ. As. Soc. Bengal vol. 44. pt. 2. 198.

Burmah, in the Martaban Hills, at elevations of from 3,500 to 6,000 feet,—*Kurz, Brandis.*

A species distinguished from all others by its variable leaves. Its nearest ally is the Bornean species *C. Mottleyana*, King.

PLATE 85A.—*C. diversifolia*, Kurz. 1, branch with panicle; 2, leaf from another branch; 3, ripe fruit,—*all of natural size.*

5. CASTANOPSIS MOTTLEYANA, *nov. spec.*

Young shoots densely and minutely ferruginous-tomentose. *Leaves* coriaceous, ovate-oblong to obovate-oblong, shortly acuminate, entire; the base acute; upper surface rugose, glabrous, except the pubescent midrib; under surface ferruginous, pubescent; the midrib and 11 to 15 pairs of prominent nerves tomentose, transverse venation distinct; length of blade 7 to 9 in., breadth 3 in. to 3·5 in.; petiole ·5 in., stout, tomentose. *Female spikes* solitary, axillary, about as long as the leaves; the rachis stout, tuberculate. Young involucres sessile, depressed-globose, densely covered with numerous, stout, simple, straight, conical, hispid prickles with glabrous sharp apices. *Ripe fruit* unknown. *Nuts* three, densely rufous-pubescent.

Borneo in Sarawak,—*Beccari* (*P. B.* 2613.)

Known only by Signor Beccari's specimens, none of which have male spikes or ripe fruit. A well-marked species, quite distinct from any other known *Castanopsis*. I have dedicated it to Mr. Mottley, an excellent collector in the Malayan countries whose services to botany have been but scantily recognised.

PLATE 86.—*C. Mottleyana*, King. Branch with spikes of young fruit,—*of natural size*. 1, vertical section of fruit; 2, spines: *enlarged*.

6. CASTANOPSIS TUNGURRUT, *A. DC. in Seem. Journ. Bot.* (1863) 182; *Prod.* xvi. ii. 110.

Young branches and inflorescence minutely furfuraceous-tomentose. *Leaves* coriaceous, elliptic-oblong to elliptic, acute or acuminate, entire; the base rounded or slightly acute; upper surface shining, glabrous; lower minutely pubescent, adpressed on nerves and midrib; nerves 12 to 16 pairs, prominent beneath; length of blade 4·5 in. to 8 in., breadth 1·75 in. to 3 in.; petiole ·5 in. *Spikes* about as long as the leaves, solitary, axillary, or in small lax panicles; the female spikes few, female flowers solitary. *Ripe fruit* as in *C. Javanica*, except that the spines are longer.—*Miq. Ann. Mus. Lugd. Bat.* i. 120.—*Castanea Tungurrut*, Bl. Bijdr. 525; Fl. Jav. Cupul. 42. t. 22; Mus. Bot. Lugd. Bat. i. 283; Miq. Pl. Jungh. 13; Fl. Ind. Bat. i. 1. 866; Suppl. 353.

Java and other parts of the Malay Archipelago, at elevations of from 4,000 to 6,000 feet.

This comes near *C. Javanica*, A. DC., but is readily distinguished in the herbarium by the olivaceous, not rufous, tint of the pubescence of its adult leaves, and by the greater number of their nerves. The plant issued by Wallich under this name (No. 2763 of his Catalogue) is not *Tungurrut*, Bl., but a distinct species which I have named after Wallich. Kurz's *C. argentea*, var. *Tungurrut*, is simply *argentea*.

PLATE 87.—*C. Tungurrut*, A. DC. 1, young twig with male spikes; 2, young female spikes; 3, ripe fruit,—*all of natural size*.

7. CASTANOPSIS JAVANICA, *A. DC. in Seem. Journ. Bot.* i. (1863) 182; *Prod.* xvi. ii. 111 (*cum* var. *montana*).

Young shoots covered with minute rufous pubescence. *Leaves* coriaceous, ovate-lanceolate or oblong-lanceolate, shortly acuminate, entire; the base acute; upper surface glabrous; lower minutely fulvous or rufous often cinnamoneous-pubescent, ultimately becoming glabrous or sub-glabrous; nerves 9 to 12 pairs, bold and prominent beneath. *Spikes* androgynous, minutely fulvous or rufous-tomentose, erect, in axillary or terminal fascicles or small panicles longer than the leaves; the male spikes numerous; female flowers in threes on the lower part of only a few spikes. *Ripe fruit* sub-globular, from 1·5 to 2·5 in. in diameter; the involucre thick-walled, woody, densely covered with tufts of simple or branching, radiating, curved, subulate spines, ·25 to ·5 in. long, with pubescent bodies and glabrous apices. *Nuts* 1 to 3, ovoid-globose, with one side flattened, densely rufous-tomentose.—*Miq. Ann. Mus. Lugd. Bat.* i. 120; *Hook. fil. Fl. Br.*

Ind. v. 620.—*Castanea Javanica*, Bl. Bijdr. 525; Fl. Jav. Cupul. *cum* var. *montana*, 44. t. 23; Mus. Lugd. Bat. i. 283; Miq. Pl. Jungh. 13; Fl. Ind. Bat. i. 1. 867; Kurz For. Fl. Burm. ii. 479.—*C. Javanica*, Bl., var. *montana;* Fl. Jav. Cup. 44. t. 24.—*Castanea montana*, Bl. Bijdr. 526; Miq. Fl. Ind. Bat. i. 1. 867.—*C. costata*, A. DC. Prod. xvi. ii. 110; Miq. Ann. Mus. Lugd. Bat. i. 1. 120; var. *Bancana*, Scheff. Obs. Phyt. ii. 50.—*Castanea costata*, Bl. Mus. Bot. Lugd. Bat. i. 284; Miq. Fl. Ind. Bat. i. 1. 866.—*C. trisperma*, Scheff. Obs. Phyt. ii. 50.—*Castanea brevicuspis*, Miq. Fl. Ind. Bat. i. 1. 866.—*C. spectabilis*, Miq. l. c. 866; Ann. Mus. Lugd. Bat. i. 120.

Java, Sumatra, Bangka, Borneo, Malacca,—*Maingay*, 1461 (mixed with acorns of *Quercus Sundaica*, Bl.); Perak,—*King's Collector* and *Father Scortechini*—common; Lower Burmah,—*Parish* (once collected); Penang,—*Phillips;* Singapore,—*Cantley*.

Blume does not appear to have had a very clear idea of his species *C. Javanica*, for his figure of it does not tangibly differ from his figure of *C. argentea.* And of his species *C. costata* he had never seen fruit. I have carefully examined the material in his herbarium at Leiden. It is very scanty indeed, and I can quite understand how, with such poor specimens to work upon, he arrived at rather dubious results. I can see no specific difference between the type specimens of his *Javanica* and *costata;* nor can I see how Scheffer's *C. trisperma* is to be distinguished from Blume's *C. Javanica.* Scheffer trusts to the three nuts as a diagnostic mark of *trisperma*, because Blume describes his *Javanica* as having only one. But some of Blume's own specimens show that the nuts are in threes. Miquel himself reduces (in *Ann. Mus. Lugd. Bat.* i. 120) his species *brevicuspis* and *spectabilis* to *costata.*

PLATE 88.—*C. Javanica*, A. DC. 1, flowering-branch; 2 & 3, leaves of different forms; 4, ripe fruit showing the smooth patch,—*all of natural size.*

8. CASTANOPSIS ARGENTEA, *A. DC. Seem. Journ. Bot.* i. (1863) 182; Prod. xvi. ii. 112 (*cum.* var. *Martabanica*).

Young shoots glabrous, glaucous, lenticellate. *Leaves* membranous, lanceolate or oblanceolate-oblong to elliptic-lanceolate, shortly acuminate or acute, entire; the base acute or sub-acute; both surfaces glabrous; the lower pale and sub-silvery or glaucous; nerves 7 to 10 pairs, curving, thin, but prominent beneath; length of blade 4 to 8·5 in., breadth 1·25 to 3 in.; petiole ·5 in. to ·75 in. Flowers on stout, fulvous-pubescent, solitary, axillary spikes, or in lax, terminal panicles shorter than the leaves. *Female spikes* few; the flowers solitary. *Ripe fruit* nearly globular, about 2 in. in diameter; the involucre densely clothed with numerous tufts of branching, radiating, curving, subulate spines, ·3 in. to ·4 in. long with cinereous-pubescent bodies and pale glabrous apices. *Nut* usually single, sub-globular, smooth, and adpressed-pubescent, except the large attached surface which is rough and glabrous, about 1 in. in diameter.—*Miq. Ann. Mus. Lugd. Bat.* i. 120; *Hook. fil. Fl. Br. Ind.* v. 621.—*Castanea argentea*, Bl. Bijdr. 525; Fl. Jav. Cupul. 40. t. 21; Mus. Lugd. Bat. i. 282; Miq. Pl. Jungh. 13; Fl. Ind. Bat. i. 1. 867; Kurz For. Fl. Burm. ii. 479; var. *tungurrut*, Kurz (not of Bl.) l.c.—*Castanea Martabanica*, Wall. Cat. 2764; Wall. Pl. As. Rar. ii. 6. t. 107.

Java, Borneo, and other islands of the Malay Archipelago, at elevations up to 4,000 feet; Hill ranges of Burmah,—*Kurz, Parish, Anderson;* Tenasserim,—*Helfer* (4443).

This species is closely allied to *C. Javanica*, Bl., with which it is often confused in collections. It may be distinguished by its leaves having finer nerves and being paler beneath than *Javanica.* Its young branches are, moreover, glabrous and glaucous, whereas those of *Javanica* are pubescent. Burmese specimens have narrower leaves than those from the Malayan islands. I have seen no specimens from Perak. An exploration of the central dividing range of the Malayan Peninsula will doubtless show that the distribution of this species is continuous from Burmah southward to the Archipelago.

PLATE 89.—*C. argentea,* Bl. 1, flowering-branch; 2, leaf from another specimen; 3, spike with young fruit; 4, ripe fruit,—*of natural size.*

9. CASTANOPSIS BORNEENSIS, *nov. spec.*

All parts glabrous. *Leaves* coriaceous, on rather slender petioles, lanceolate, acuminate, entire; the base acute; upper surface shining, the lower dull and slighty paler; nerves 8 or 9 pairs, not prominent; length of blade 3 to 3·5 in., breadth 1·25 to 1·5 in.; petiole ·5 in. *Female spikes* solitary, much longer than the leaves when adult, the rachis stout. *Fruit* sessile, globular, about 1·25 in. in diameter; the involucre densely covered with stout, branching spines which are flattened at the base, spreading, recurved, striate, sub-glabrous, about ·35 in. long. *Nut* single, depressed-globose.

Borneo, in Sarawak,—*Beccari* (*P. B.* 1212, 3078).

Collected only by Signor Beccari. Male flowers unknown.

PLATE 90.—*C. Borneensis,* King. 1, leafy branch; 2, spike with nearly ripe fruit,—*of natural size.*

10. CASTANOPSIS CASTANICARPA, *Spach. Hist. Veg. Phan.* xi. 185.

Young branches, petioles, and inflorescence softly pubescent; all other parts glabrous. *Leaves* sub-coriaceous, large, ovate-oblong or obovate-oblong, shortly acuminate, entire; the base acute; both surfaces, when adult, shining and glabrous; the reticulations minute, distinct; nerves about 10 pairs, thin, but prominent beneath; length of blade 10 to 12 in., breadth 4 to 4·5 in.; petiole about ·5 in., stout. *Female spikes* solitary, axillary, shorter than the leaves; the flowers solitary or in threes. *Ripe involucre* ovoid, about 1·25 in. long, pubescent, densely covered with straight, striate, flat, sub-pubescent, sharp, rather weak spines, about ·3 in. long, and united into tufts by their bases only. *Nut* single, ovoid, with a longish point, smooth, about ·5 in. long.—*A. DC. Prod.* xvi. ii. 111; *Miq. Ann. Mus. Lugd. Bat.* i. 119.—*Castanea Roxburghii,* Lindl. in Wall. Pl. As. Rar. ii. 6; Hook. fil. Fl. Br. Ind. v. 621; Kurz. For. Flor. Burm. ii. 480.—*Quercus castanicarpa,* Roxb. Pl. Corom. iii. 93. t. 296; Fl. Ind. iii. 640; Wight Ic. 769.

Chittagong: on low dry hills,—*Roxburgh, Hooker.*

In Roxburgh's time this appears to have been rather a common species near Chittagong, and Sir Joseph Hooker found it there in 1849-50. A collector, sent to the Chittagong Hills from the Botanic Garden, Calcutta, in 1886 for the purpose of collecting this failed, however, to find a single tree; it must therefore now be exterminated, or nearly so, in the Chittagong district—a fate, alas! not peculiar to this species. Male flowers of this are unknown.*

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* NOTE.—Since the above was written, a ripe fruiting-specimen (of which I give a figure) has been sent to me from a remote part of the Chittagong Hill Tracts by Mr. Dowling, a gentleman residing there, to whom I am indebted for much assistance in the botanical exploration of that difficult country.

Plate 91.—*C. castanicarpa*, *Spach.* 1, branch with fruit (copied from Roxburgh's unpublished drawing in Herb. Calc.); 2, ripe fruit collected by Mr. Dowling,—*both of natural size.*

11. Castanopsis Catappæfolia, *King in Hook. fil. Fl. Br. Ind.* v. 621.[*]

Young shoots as thick as the little finger, minutely furfuraceous-puberulous, soon becoming glabrous. *Leaves* large, on short, thick petioles, coriaceous, oblanceolate, acute, entire, gradually narrowed from the middle to the short, stout petiole; upper surface glabrous, shining; the petiole and nerves puberulous; lower dull, very minutely puberulous; the nerves from 20 to 25 pairs, rather transverse, bold and conspicuous on the lower surface, impressed on the upper; length of blade 18 to 20 in., breadth about 7·5 in.; petiole ·5 in. *Female spikes* 10 or 11 in. long, glabrous; flowers in glomeruli of 3 or 4. Fruit (not quite ripe) sub-globose or oblong, obscurely 4-angled, from 1·5 in. to 2 in. in diameter; the involucre rather thin and crustaceous, densely covered externally with numerous tufts of simple, subulate, slightly flattened, striate, nearly glabrous, sharp-pointed, spreading spines, about ·3 in. long. *Nuts* 1 or 2, ovoid-globose, adpressed-sericeous, more than 1 in. long.

Perak, in the Goping district, at elevations of about 400 feet,—*King's Collector* (8137).

A fine species, collected only once by the late Mr. Kunstler. The pubescence on the under surface of the leaves is so minute that it can be seen only under a strong lens and when scraped off by a knife. Male spikes of this are unknown.

Plate 92.—*C. catappæfolia*, King. 1, leaf with spike of female flowers; 2, spike with fruit in various stages; 3, glans,—*of natural size.*

12. Castanopsis argyrophylla, *King in Hook. fil. Fl. Br. Ind.* v. 622.

Young shoots pubescent. *Leaves* thinly coriaceous, elliptic-lanceolate or oblong-lanceolate, acute, entire; the base acute; nerves 10 to 12 pairs, thin, but prominent beneath; both surfaces glabrous, the lower glaucescent; length of blade 4·5 to 6 in., breadth 1·75 in. to 2·5 in.; petiole ·75 to 1·15 in. *Flowers* in small fulvous-tomentose, axillary panicles, longer than the leaves. *Female spikes* few; the flowers single. *Ripe fruit* ovoid, about 1·25 in. long; the involucre with thin, brittle, sub-glabrous, glaucous walls, thickly covered with tufts of simple or branching, subulate, radiating, glabrous spines about ·25 in. long. *Nuts* 1 to 3, ovoid-globose, compressed on one side, densely but deciduously rufous-tomentose.—*Cast? argyrophylla*, Wall. Cat. 2788.—*Castanea tribuloides*, A. DC., var. *ferox*, Kurz. For. Fl. Burm. ii. 481.

Burmah, near Rangoon,—*Wallich*, *McClelland*, *Scott*, ? *Maingay* (*Kew Distrib.* 1457-2); Pegu and Martaban,—*Kurz* (998); Tenasserim,—*Helfer* (4466); Arracan,—*Hilldebrand.*

This species has not been often collected since Wallich's time, and it is poorly represented in most herbaria. It comes nearest to *C. argentea*, A. DC. (to which DC. refers the Wallichian sheet 2788); but it is distinguished from that species by the pubescence of its young shoots, by its longer-petioled broader leaves, by its perfectly glabrous thin-walled involucre and densely fulvous-tomentose nuts. The leaf characters are, however, not very well-marked, and in absence of fruit it is not easy to recognise this species.

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[*] *By a printer's error spelt Catalpæfolia in Fl. Br. Ind. The name Catappæfolia was given because of the resemblance of the leaves of this plant to those of Terminalia Catappa,* Linn.

On this account I refer Maingay's specimens (*Kew Dist.* 1457-2) here with some hesitancy. This species is allied also to *C. tribuloides*, A. DC.

PLATE 85B.—*C. argyrophylla*, King. 4, flowering-branch; 5, ripe fruit,—*of natural size.*

13. CASTANOPSIS ARMATA, *Spach. Hist. Nat. Phan.* xi. 185.

Young shoots minutely cinereous-tomentose; all other parts, except the inflorescence, glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, gradually narrowed to the much acuminate apex, entire; the base rounded or acute; upper surface shining, the lower dull, pale; nerves 8 to 12 pairs, thin, but prominent on the lower surface and much curved; length of blade 4·5 to 7 in., breadth 1·25 to 2·25 in.; petiole ·4 in. *Male spikes* axillary or terminal, solitary, or sub-paniculate, longer than the leaves, erect; the flowers solitary, or in glomeruli. *Female spikes* a few in the panicle with the males or in separate branches, solitary or terminal; the flowers solitary. *Ripe fruit* from 1·25 to 1·75 in. in diameter, ovoid, slightly flattened on one side, thick-walled, externally cinereous-pubescent and bearing numerous groups of spines arranged in imperfect curving zones; the spines simple or branching, stout, radiating, flattened and pubescent below, but with sharp, glabrous, apices, from ·15 in. to ·25 in. long. Nut solitary, compressed-ovoid.—*Hook. fil. Fl. Br. Ind.* v. 622; *Miq. Ann. Mus. Lugd. Bat.* i. 119.—*Quercus armata*, Roxb. Pl. Corom. iii. t. 296; Fl. Ind. iii. 640; Wight Ic. 770.—*Castanea tribuloides*, A. DC., var. *armata*, Kurz For. Fl. Burm. ii. 480.—*Castanea Falconeri*, Hance Journ. Bot. for 1875, 367.—*Castanea sphærocarpa*, Lindl. in Wall. Cat. 3736, and in Pl. As. Rar. ii. 5.

In the forests at the base of the Sikkim and Bhotan Himalaya, in Assam and Cachar, and on the Khasia and Chittagong and Burmah Hill Ranges, up to elevations of 2,000 to 3,000 feet.

The involucre of this is very characteristic. Its walls are not quite covered, as in *C. tribuloides*, by the prickles, but these are seen to be arranged in two series of curved semi-zones on the rounded surface, the flattened part being almost free from prickles. In foliage this resembles *C. argentea*. but the involucre of the latter is almost completely covered by long slender prickles. This species is very badly represented in collections, and this fact no doubt accounts for M. De Candolle having reduced it to *C. tribuloides*, from which it is really very distinct. Mr. Gustav Mann, Conservator of Forests in Assam, has recently sent numerous specimens from the Assam Hills, while a collector sent from the Botanic Garden, Calcutta, has supplied an abundance of good specimens from the Chittagong Hill Tracts. In Don's Prodromus of the Flora of Nepal *Q. armata*, Roxb. is quoted as a synonym of *Q. tribuloides*, instead of *Q. ferox*, the allied species with armed involucres which Roxburgh described from the same localities as this. I reduce Hance's *C. Falconeri* to this species without any hesitation. In originally describing *C. Falconeri*, Dr. Hance remarks that he had never seen a specimen of Roxburgh's *C. armata*, but that, judging from his figure of it published by Wight (*Ic.* 770), the two must be closely allied. Dr. Hance further remarks that both species have very sinuate cotyledons—a character not hitherto recorded in the group, except in Wight's copy of Roxburgh's figure just quoted. From this peculiarity in the cotyledons, Dr. Hance argues that M. De Candolle must be wrong in reducing *Q. armata*, Roxb., to *C. tribuloides*, A. DC.—an opinion at which I have also arrived for a different reason. There is no doubt the cotyledons are sinuate in this species. But a character derived from the cotyledons in this family is usually impossible of verification in the herbarium; for, unless the fruit has been thoroughly ripe when collected, its contents speedily decay. I have not therefore thought it worth while to work it.

PLATE 93.—*C. armata*, Spach. 1, branch with male spikes; 2, female spikes; 3, ripe fruit,—*of natural size.*

14. CASTANOPSIS TRIBULOIDES, *A. DC. in Seem. Journ. Bot.* i. (1863) 182; *Prod.* xvi. ii. 111.

Young shoots and under surfaces of young leaves more or less covered with cinereous or (in the varieties) ferruginous or rufous pubescence. *Leaves* lanceolate, oblong-lanceolate or (in var. 2) ovate-lanceolate, acuminate, entire, or sometimes serrate towards the apex; the base more or less acute; upper surface glabrous when adult; the lower pubescent, or glabrous in very old leaves, paler or redder than the upper; nerves 10 to 13 pairs, thin but prominent beneath; length of blade 3 to 5 in., breadth 1 to 1·25 in. (much more in var. *longispina*); petiole from ·25 in. to ·5 in. *Spikes* longer than the leaves; the male in terminal or sub-terminal panicles or fascicles, minutely tomentose; flowers glomerulate. *Female spikes* solitary, axillary; the flowers solitary. *Ripe involucres* from ·5 in. to 1 in. in diameter, ovoid, cinereous, (or in the vars.) ferruginous or rufous-tomentose, ovoid, bearing ridges with numerous simple or branching, slightly flattened, stout, spreading or curved, pubescent spines, the apices of which are pale and glabrous. *Nut* single, from ·4 in. to ·75 in. long, ovoid, pointed, adpressed-pubescent when young, glabrous when ripe.—*Hook. fil. Fl. Br. Ind.* v. 622; *Brandis For. Flora* 490 (excl. syn. *Q. armata, Roxb.*); *Gamb. Ind. Timb.* 389.—*Q. tribuloides*, Smith in Rees' Cycl. 13.—*Castanea tribuloides*, Lindl. in Wall. Pl. As. Rar. ii. 6; Kurz For. Flora Burm. ii. 480; Wall. Cat. 2765.—*Q. armata*, Don Prod. Fl. Nepal 56 (not of Roxb.)—*C. ferox*, Spach. Hist. Pl. Phan. xi. 180; Miq. Ann. Mus. Lugd. Bat. i. 119 (exclude syn. *Q. armata*, Roxb., from all the foregoing).—*Castanea microcarpa*, Wall. Cat. 3735 (by error 2735).—*Q. acuta*, Herb. Ham.

Of this there are five distinguishable forms:—

VAR. TYPICA.

Adult leaves entire; pubescence cinereous; spines numerous, long, slender, and covering the walls of the involucre; nuts usually solitary.—*Q. tribuloides*, Sm. Rees' Encyc.—*Q. armata*, Don (not of Roxb.) Prod. Fl. Nep. 56 (excl. syn. *Q. armata*, Roxb).—*Castanea tribuloides*, Lindl. in Wall. Pl. As. Rar. ii. 6; Wall. Cat. 2765A.—*C. microcarpa*, Lindl. in Wall. Cat. 3735 (by error 2735).

Himalaya, from Kumaon to Sikkim, at elevations of 2,500 to 7,000 feet. Khasia and Naga Hills in the Assam range, at elevations of 4,000 to 5,000 feet.

This is the only *Castanopsis*, except *C. indica*, which occurs in the Western and Central Himalaya, but there it is very common. This variety is not so common in Sikkim and Bhotan as the third. It occurs, however, in the Khasia Hills at the elevations indicated.

VAR. FEROX, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Leaves lanceolate to oblong-lanceolate, usually entire, but sometimes serrate near the apex, especially when young; involucres larger than in the typical form; the spines stouter but fewer; nuts 1 to 3.—*C. ferox*, Spach. Hist. Nat. Phan. xi. 180; Miq. Ann. Mus. Lugd. Bat. i. 119.—*Q. ferox*, Roxb. Fl. Ind. iii. 639; Wight. Ic. 218.

At the base and on the lower slopes of the Eastern Himalaya, on the Assam and Chittagong ranges, and in Upper Burmah, from 500 up to elevations of 4,000 feet.

This is the true *Q. ferox* of Roxb., of which he left an admirable coloured drawing in the Calcutta Herbarium.

VAR. LONGISPINA, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Leaves larger and broader than in the last (from 6 to 8 in. long and from 2 to 3 in. broad), lanceolate-ovate to elliptic-oblong, rufous-pubescent (often cinnamoneous) when young or glabrous, beneath; spines of involucre stout, curving, often ·5 in. long; nuts 1 to 3.—*Castanea tribuloides*, A. DC., var. *ferox*, Kurz For. Flora Burmah ii. 480.

On the lower slopes of the Eastern Himalaya; on the Assam and Chittagong ranges; in Upper Burmah, from 500 up to elevations of 4,000 feet.

VAR. ECHIDNOCARPA, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Pubescence ferruginous; leaves sometimes serrate when young, elliptic-lanceolate, often caudate; involucre smaller than in the typical form, and less covered by the spines, which are fewer and shorter; nut solitary.—*C. echidnocarpa*, A. DC. in Seem. Journ. Bot. (1863) 182; Prod. xvi. ii. 112; Miq. Ann. Mus. Lugd. Bat. i. 119.—*Castanea echidnocarpa*, Hook. fil. and Thoms. MSS.—*Quercus? caudata*, Lindl. in Wall. Cat. 2787; Griff. (4446 and 4447).

Sikkim–Himalaya; Khasia, and other parts of the Assam Hills; at similar elevations with the typical form; Upper Burmah,—*Dr. J. Anderson.*

Castanopsis Chinensis, Hance, a species found in China, comes very near this, but has narrower, more acuminate, more glabrous leaves with fewer nerves.

VAR. WATTII, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Leaves as in the last; involucre small, thick, almost woody, densely clothed with short-branched, often rufous, spines; inner surface rufous-villous, dehiscing to the very base; nuts 2 to 3.

Munipore, altitude 2,000 feet,—*Watt;* Khasia Hills (at Maobleh),—*Clarke*, 4,000 feet; Sikkim,—*King*, 5,500 feet.

PLATE 94.—*C. tribuloides*, A. DC. 1, flowering-branch; 2, spike of young fruit; 3, spike of ripe fruit,—*all of natural size.*

PLATE 95.—*C. tribuloides*, A. DC., var. *ferox*. 1, leaf-twig; 2, spike with fruits in various degrees of ripeness; 3, ripe fruit of var. *longispina;* 4, young fruit-spike of same; 5, leaf of same,—*all of natural size.*

PLATE 96.—*C. tribuloides*, A. DC., var. *echidnocarpa*. 1, branch with male spikes,—*of natural size;* 2, part of the same: *enlarged;* 3, spike of ripe fruit,—*of natural size;* 4, fruit of var. *Wattii*,—*of natural size.*

15. CASTANOPSIS SUMATRANA, *A. DC. in Seem. Journ. Bot. for* 1863, 182; *Prod.* xvi. ii. 113.

Young shoots scantily and deciduously puberulous; all other parts, except the inflorescence, glabrous *Leaves* thinly coriaceous, oblong-lanceolate or oblong-oblanceolate, rarely elliptic-lanceolate, shortly acuminate, entire; the base acute or acuminate; nerves 10 to 12 (rarely as many as 15) pairs, thin, but prominent on both surfaces; length of blade 4 to 7 (rarely so much as 9) in., breadth 1·75 in. to 3 in., rarely 4 in.; petiole ·75 to 1 in. *Spikes* cinereous-pubescent, in long-peduncled, few-branched, terminal or axillary panicles, or axillary, the majority bearing male flowers only, a small number bearing female flowers with a few males at the apex. *Female flowers* in groups of three or four. *Ripe fruit* sub-globose to sub-ovoid, minutely furfuraceous-tomentose, sometimes depressed vertically and flattened laterally, more or less angled, from 1 in. to 1·25 in. long; the involucre thick-walled, brittle, bearing externally 3 or 4 irregular, transverse, faintly tuberculate, wavy zones; when young depressed-globose, 3 or 4-angled, narrowed to a short, thick peduncle; the zones interrupted and marked by double rows of bold hard short tubercles; dehiscing irregularly or not at all. *Ripe nuts* single and ovoid, or two or three and ovoid-complanate, adpressed-pubescent or glabrous, the rugose hilum occupying one-third of the whole.—*Hook. fil. Fl. Br. Ind.* v. 623.—*Callæocarpus Sumatrana*, Miq. Pl. Jungh. 13.; Fl. Ind. Bat. i. 868 (excl. syn.); Suppl. 353; Ann. Mus. Lugd. Bat. i. 118.—*Castanea inermis*, Lindl. in Wall. Pl. As. Rar. ii. 6; Wall. Cat. 2762; DC. Prod. xvi. ii. 116; Kurz For. Flor. Burm. ii. 481—*C. mitifica*, Hance in Journ. Bot. for 1878, 200.—*Castanea glomerata*, Blume Mus. Lugd. Bat. i. 283.—*Quercus glomerata*, Wall. (not of Roxb.) Cat. 2791.

Sumatra, Java, Linga—*various collectors;* Borneo,—*Beccari* (*P.B.* 2756, 2973); Singapore,—*Wallich;* Malacca,—*Griffith* (4442, 4470); Burmah,—*Griffith* (4471), *Maingay* (1457); Perak and Penang,—*King's Collector*, *Scortechini.*

A large tree, widely distributed in the Malayan region, and readily distinguished by its involucres. Good specimens of it are, however, by no means common in collections, and hence the rather extensive synonymy. The first published name for the plant (1831) was that of Lindley, viz. *Castanea inermis* (Wallich's *Plantæ Asiaticæ Rariores*). This name was founded on specimens which Wallich had previously distributed under this name as No. 2762 of his Catalogue. Wallich, however, also distributed this species under the number 2791 and the name *Quercus glomerata*, Roxb. But the specimens so named by Wallich were not Roxburgh's *Q. glomerata*, a plant which must be a true *Quercus*, as is evident from Roxburgh's description of its "acorns" as "ovate, smooth, half hid in the tubercled cup." Blume, accepting Wallich's No. 2791 as really Roxburgh's plant, re-named it *Castanea glomerata.* On specimens of this plant collected in Sumatra, Miquel founded his genus *Callæocarpus* and his species *C. Sumatrana* (*Pl. Jungh.* 13). The same author was the first to point out (*Fl. Ind. Bat. l.c.*) the identity of his own *C. Sumatrana* with Wallich's *Q. glomerata.* M. De Candolle reduced *Callæocarpus* to a section of *Castanopsis*, and in this he has been followed by Messrs. Bentham and Hooker. The late Dr. Hance, while admitting that he had never seen good specimens of *C. Sumatrana*, described (*Journ. Bot. l.c.*), under the name of *C. mitifica*, a species which he remarked must be near *C. Sumatrana.* I have examined Dr. Hance's type specimen of *C. mitifica* in the British Museum, and I cannot see how it is to be separated from *C. Sumatrana.*

M. De Candolle describes the involucres of *C. Sumatrana* as containing three nuts, but his description indicates that only one of them usually attains full size. As a matter of fact two of the nuts are sometimes developed, and between them there is wedged a small, flattened, aborted third nut. In other involucres only a single nut attains maturity.

PLATE 97.—*C. Sumatrana*, A. DC. 1, branch with young spikes; 2, spike with expanded male flowers; 3, spike of ripe fruit; 4, involucre containing two nuts (*seen from the side*); 5, involucre containing one nut,—*of natural size.*

16. CASTANOPSIS HULLETTII, *King in Hook. fil. Fl. Br. Ind.* v. 623.

Young shoots thick, minutely scurfy-tomentose, lenticellate. *Leaves* coriaceous, oblong-lanceolate, elliptic-lanceolate to elliptic, acute or sub-acute, entire; the base acute or sub-acute, sometimes rounded and slightly unequal-sided; upper surface glabrous, shining, the midrib very prominent; lower surface dull, rufous; everywhere very minutely adpressed-furfuraceous-pubescent, except the 16 to 18 pairs of nerves which are glabrous and prominent; the midrib sparsely sub-adpressed, pubescent or glabrous, stout; length of blade 5 to 9 in., breadth 2 to 3 in.; petiole ·75 to 1·25 in. *Male spikes* in axillary or terminal fulvous-tomentose panicles. *Female spikes* solitary, axillary; the rachis rugose, thick, furfuraceous-tomentose, like that of the males; flowers in groups of three or four. *Ripe fruit* sessile, about 1·5 in. in diameter, depressed, sub-globose, sometimes constricted towards the base, obscurely three or four-angled; the involucre thick-walled, with three or four rather prominent vertical grooves externally, and about four sets of very prominent, thick, wavy, more or less tuberculate, horizontal ridges; dehiscing to near the base into 3 or 4 unequal valves. *Nuts* two to four, hemispheric-complanate, about ·65 in. long, shining, smooth, sparsely covered with retroversed, adpressed-fulvous hairs; the hilum large, dull, rugose, glabrous.

Singapore,—*R. H. Hullett, King's Collector;* Perak,—*King's Collector;* Malacca,—*Maingay* (1463); Riou,—*Teysmann;* Billiton, *Riedel.*

A large tree, rather common in Perak. The nearest ally of this is *C. Sumatrana*, A. DC., from which its many-nerved leaves and remarkable involucre distinguish it. The pubescence on the under surface of the leaves is extremely minute and, without the aid of a lens, and of a knife to scrape it off, it cannot in many cases be made out, and the leaves appear as if they were glabrous.

PLATE 98.—*C. Hullettii*, King. 1, branch with male and female spikes; 2, spike of ripe fruit; 3, a dehiscing involucre; 4, glans,—*all of natural size.*

17. CASTANOPSIS SCHEFFERIANA, *Hance in Journ. Bot. for* 1878, 200.

Young shoots cinerescent. *Leaves* coriaceous, elliptic-lanceolate, shortly acuminate, entire; the base acute; both surfaces quite glabrous, the upper shining; nerves 7 to 9 pairs, indistinct; length of blade 2·5 to 3·5 in., breadth 1 in. to 1·5 in.; petiole ·5 in. *Female spikes* solitary, axillary, glabrous, much longer than the leaves; the flowers in threes. *Ripe fruit* sub-globose, slightly flattened on one side, about 1·5 in. in diameter; the involucre indehiscent, thick-walled, woody externally, densely covered with numerous tufts of simple or branching, stout, prismatic, pubescent spines ·2 in. long, with sharp, glabrous, slightly hooked apices; the tufts arranged in wavy zones. *Nuts* 1 to 3, ovoid-complanate, sparsely covered with minute rufous-pubescence.

Island of Linga,—*Teysmann.*

The nearest ally of this is *C. rhamnifolia*, A. DC., but the leaves of this are much more coriaceous, quite glabrous, and of slightly different shape; the involucre, moreover, is of a different shape. Male spikes are unknown.

PLATE 99.—*C. Schefferiana*, Hance. Branch with ripe fruit,—*of natural size.*

18. CASTANOPSIS RHAMNIFOLIA, *A. DC. Prod.* xvi. ii. 113.

Young shoots minutely cinereous, puberulous, speedily glabrescent, lenticellate. *Leaves* thinly coriaceous, ovate-elliptic or elliptic-oblong, with a short, blunt acumen, entire; the base acute, glabrous on both surfaces, except the midrib which on the lower is sometimes minutely adpressed-puberulous; length of blade 3·5 to 6 in., breadth 1·5 to

2 in.; petiole ·3 in.; nerves 7 or 8 pairs, slightly prominent below. *Male spikes* slender, puberulous, erect, on slightly spreading, terminal panicles, which are longer than the leaves. *Ripe fruit* 1·5 in. long, ovoid, flattened on one side; the involucre thick-walled, indehiscent, 1-celled, 1-seeded, externally everywhere covered with furfuraceous cinereous tomentum and (except on the middle of the flat surface) with stout, simple, flattened, conical, tomentose spines with sharp apices, about ·2 in. long. *Nut* ovoid-globose, flattened on one side, smooth, about 1 in. long.—*Hook. fil. Fl. Br. Ind.* v. 624.—*Callæocarpus rhamnifolia*, Miq. Fl. Ind. Bat. Suppl. 353; Ann. Mus. Lugd. Bat. i. 118; Scheff. Obs. Phyt. iii. 95.—*Q. rhamnifolia*, Miq. Fl. Ind. Bat. i. 853.—*Castanea rhamnifolia*, Kurz. For. Fl. Burm. ii. 481.

The Lampongs in Sumatra; Bangka,—*Teysmann;* Burmah,—*Kurz* (2202).

Female flowers of this are unknown. Kurz's Burmese specimens are very few, and they are in fruit only. Their leaves are rather longer than in specimens from Sumatra; otherwise they agree. Brandis and Gallatly collected in Burmah a plant which in leaf much resembles this; but the male spikes (which alone are present) are very different, being much robuster and densely fulvous-tomentose. In the absence of fruit, that species—for species it apparently is—must remain unnamed.

Plate 100B.—*C. rhamnifolia*, A. DC. 4, flowering-branch; 5, unripe fruit; 6, ripe fruit,—*of natural size.*

19. Castanopsis Wallichii, *King in Hook. fil. Fl. Br. Ind.* v. 624.

Young shoots covered with minute, cinereous, sub-flocculent pubescence. *Leaves* coriaceous, lanceolate or ovate-lanceolate, shortly acuminate, entire; the base slightly unequal, acute; upper surface glabrous, except the puberulous midrib; under surface minutely cinereous or ferruginous, flocculent-pubescent; nerves 6 or 7 pairs, slightly prominent beneath; length of blade 2 to 3·5 in., breadth ·9 to 1·25 in.; petiole about ·25 in. *Male spikes* in erect, little-branched, terminal or sub-terminal, cinereous, pubescent panicles. *Female spikes* solitary, few, axillary, below the males. *Ripe fruit* 1·5 in. long, ovoid, flattened on one side; the involucre indehiscent, thick-walled, 1-celled and 1-seeded, densely covered on the rounded surface by numerous, large, stout, simple, prismatic, flattened, striate, pubescent, hooked spines about ·3 in. long; the flattened surface of the involucre with fewer spines. Nut depressed-globose, solitary.—*Castanea Tungurrut*, Wall. Cat. 2763 (not of Blume).

Penang,—*Wallich;* Malacca,—*Griffith* (4444), *Maingay* (1465); Perak,—*King's Collector* (4848); at elevations of 1,000 to 1,500 feet; Singapore,—*Cantley.*

This was originally issued without fruit as *Castanea Tungurrut*, Blume, by Wallich. Had fruit been present, it would have at once been seen that this is not Blume's plant. Griffith's specimens bear unripe fruit; and it was not until the Calcutta Garden Collector sent it from Perak that the ripe fruit was known. The species is allied to *C. rhamnifolia*, but has different leaves and more spiny involucres.

Plate 101A.—*C. Wallichi*, King. 1, flowering-branch; 2, young fruit; 3, nearly ripe fruit,—*of natural size.*

20. Castanopsis nephelioides, *King in Hook. fil. Fl. Br. Ind.* v. 624.

Young shoots covered with deciduous, fulvous, furfuraceous tomentum. *Leaves* thinly coriaceous, from elliptic to elliptic-oblong, sometimes slightly obovate; the apex with a short, blunt acumen; the edges entire; the base acute; upper surface glabrous; the lower sparsely and minutely furfuraceous-pubescent, especially on the 9 to 12 pairs of prominent nerves; length of blade 3·5 in. to 5 in., breadth 1·75 to 2·5 in.; petiole ·35 in. *Spikes* in lax, minutely tomentose, terminal, leafless panicles much longer than the leaves. *Male flowers* glomerulate; *female flowers* on the lower part of only very few spikes, solitary. *Ripe fruit* obovoid, flattened on one side, about 1 in. long; the involucre thin, crustaceous, closely adherent to, and inseparable from, the single nut; externally slightly scurfy-puberulous, and bearing numerous patelliform, short, slightly flattened, blunt, simple tubercles; cotyledons slightly sinuate

Perak,—*King's Collector*, *Scortechini.*

A handsome tree, 30 to 60 feet high. In leaf this rather resembles *Q.? divaricata*, Lindl. The curious ovoid-complanate fruit resembles that of *C. rhamnifoia*, but the tubercles are shorter and blunter.

PLATE 102.—*C. nephelioides*, King. 1, branch with ripe fruit; 2, male and female spikes; 3, ripe fruit (the internal smooth aspect); 4, the same (the external tubercled aspect),—*of natural size.*

21. C. CURTISII, *nov. spec.*

Young branches slender, glabrous, minutely lenticellate. *Leaves* sub-coriaceous, small, oblong-lanceolate, slightly inequilateral, shortly acuminate, entire, glabrous on both surfaces, the upper shining, the lower dull with minute adpressed hairs on the midrib and 10 to 12 pairs of thin prominent nerves; length of blade 2·5 to 3·5 in., breadth 1·25 to 1·5 in.; petiole ·3 in., slender. *Fruit* on stout lateral racemes more than twice as long as the leaves, the involucres solitary, pyriform, flattened or hollowed on one side and gradually narrowed to a thick peduncle, the apex excentric, the sides with many interrupted vertical ridges and densely covered (when unripe) with minute cinereous tomentum; length (unripe) 1 in., breadth ·75 in., peduncle ·35 in., nut solitary.

Penang, at an elevation of 1,000 feet,—*Mr. C. Curtis* (No. 1691).

This species has hitherto been collected by Mr. Curtis, and by him only once. His specimens have no male flowers, and only immature fruit. Its nearest ally is *C. nephelioides*, King; but it is quite distinct from that and from any other described species.

PLATE 103.—*C. Curtisii*, King. Branch with nearly ripe fruit. 1, fruit cut open,—*of natural size.*

22. CASTANOPSIS BURUANA, *Miq. Ann. Mus. Lugd. Bat.* i. 120.

Young branches thin, softly pubescent. *Leaves* oblong-lanceolate or elliptic-lanceolate, shortly acuminate, entire; the base acute, slightly unequal; upper surface glabrous; the lower covered with dense but minute fulvous-tomentum; nerves 11 to 13 pairs, thin, prominent below and, with the midrib and petiole, adpressed-pubescent. *Male spikes* not seen. *Female spikes* slender, axillary, solitary, shorter than the leaves, pubescent; flowers solitary. *Fruit* (not ripe) ovoid; the involucre cinereous-tomentose, with several wavy, concentric ridges, from which spring a few simple or agglomerate, short, stout, conical, blunt, tomentose spines with glabrous sharp points.—*DC. Prod.* xvi. ii. 111.

The Island of Boeroe,—*Teysmann.*

A species of which only very poor specimens exist in the Leiden collection. These appear to differ from any other *Castanopsis*. In leaf they resemble *C. Tungurrut;* but the fruits (only young ones being present) more resemble those of *C. Sumatrana.*

PLATE 101B.—*C. Buruana*, Miq. 4, branch with spike of female flowers; 5, very young fruits; 6, unripe fruit,—*of natural size.*

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Synonyms, vernacular names, and the names of little known and doubtful species, are in italics.

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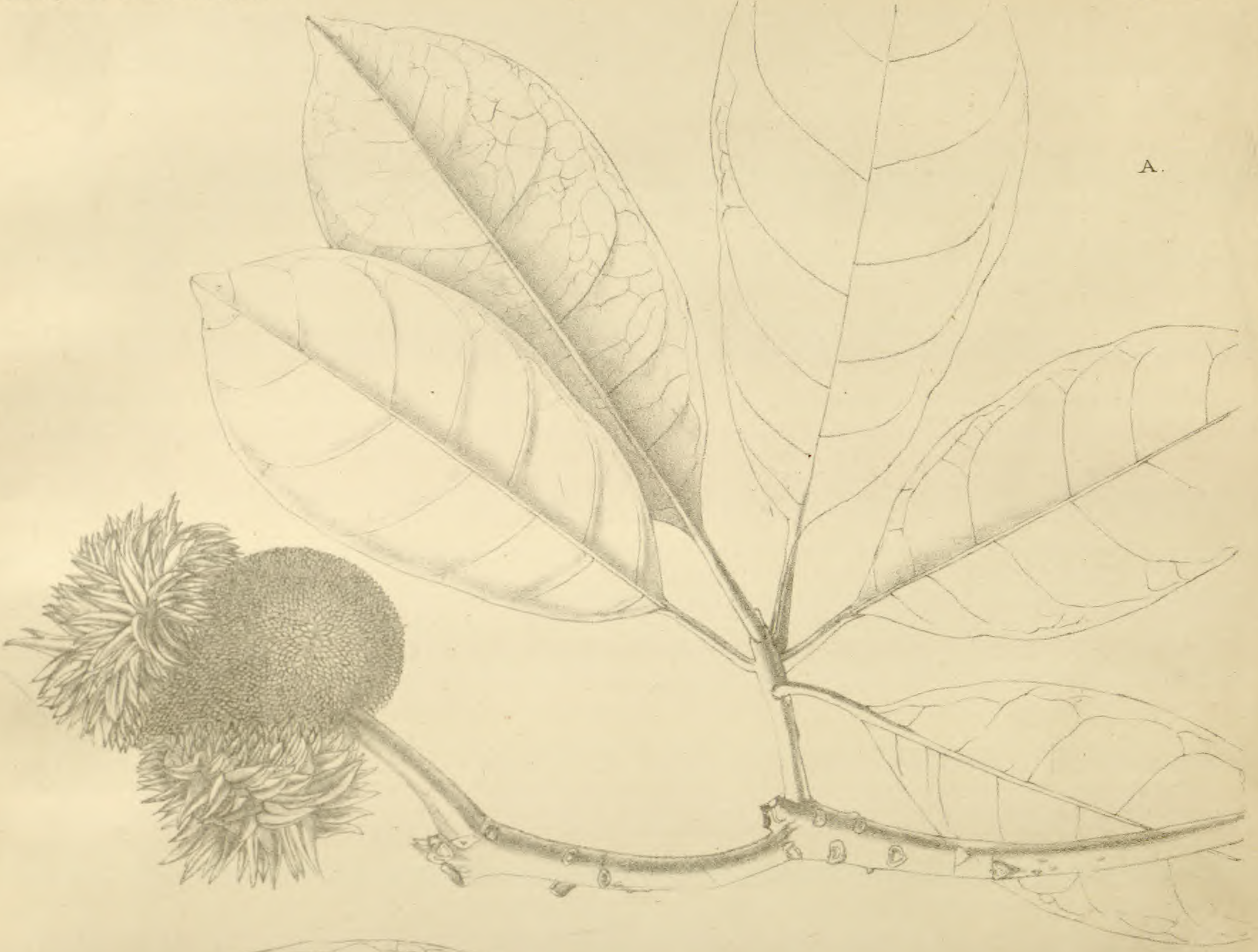
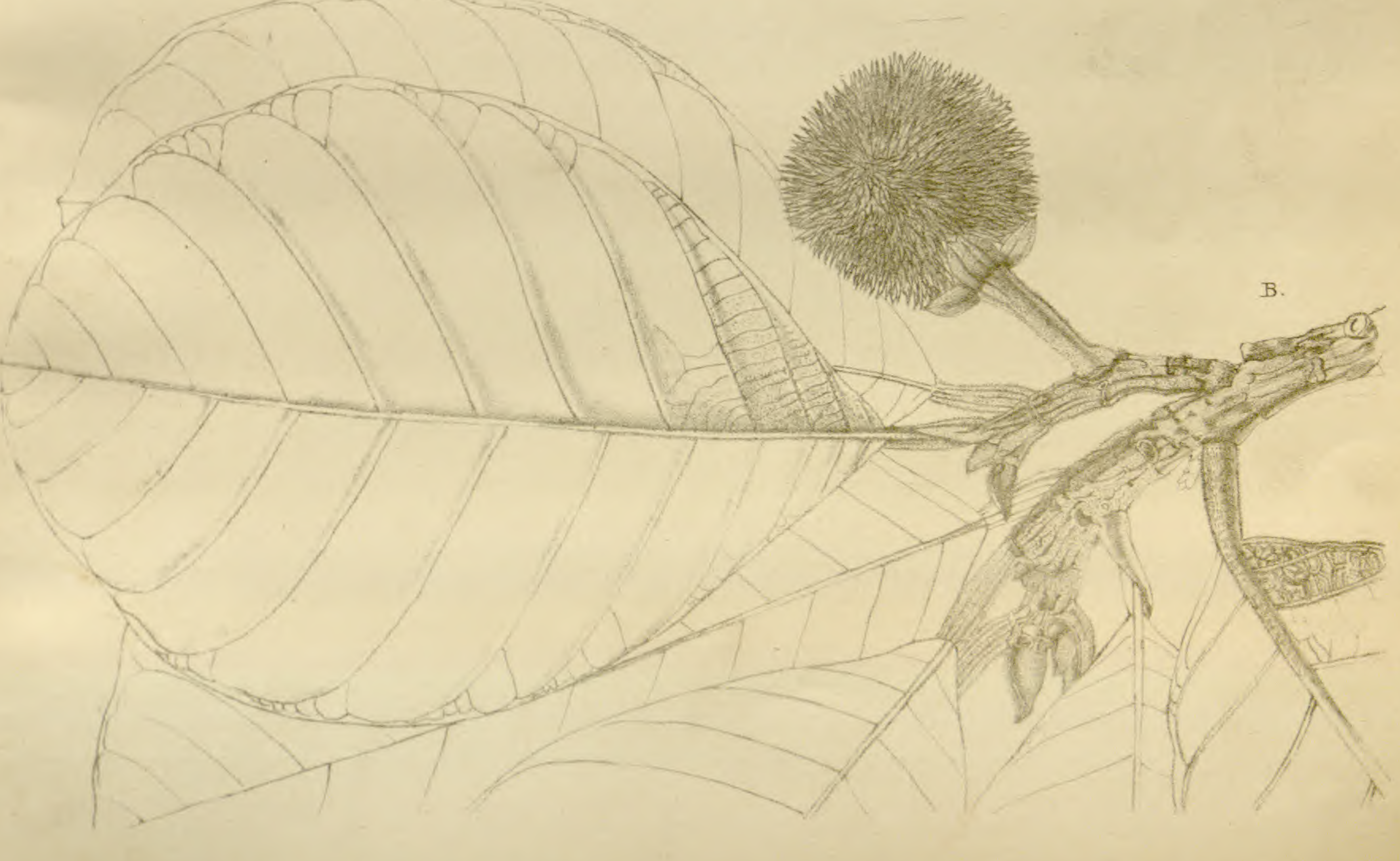


ARTOCARPUS FORBESII, King.



ARTOCARPUS BRACTEATA, King.

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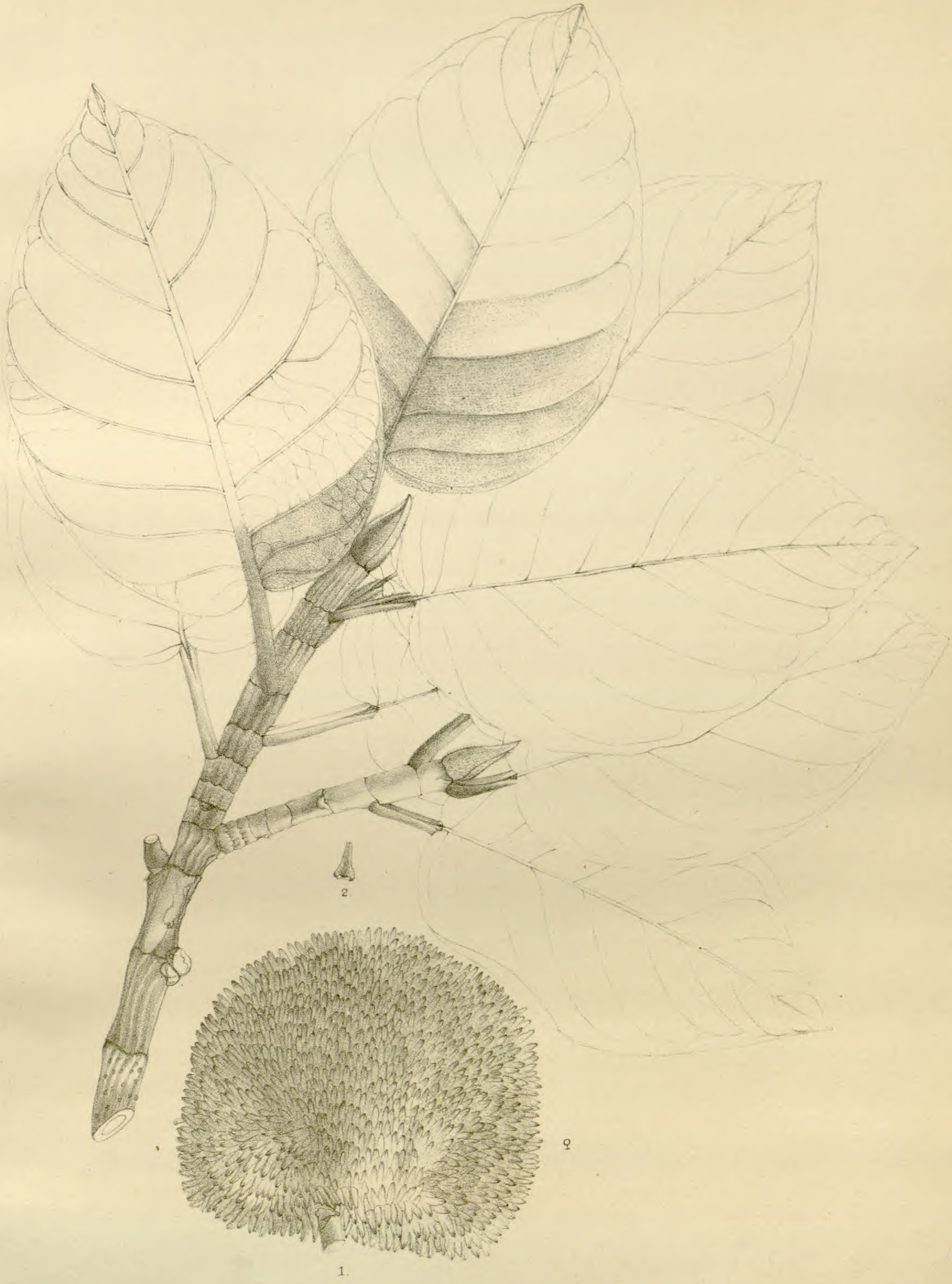

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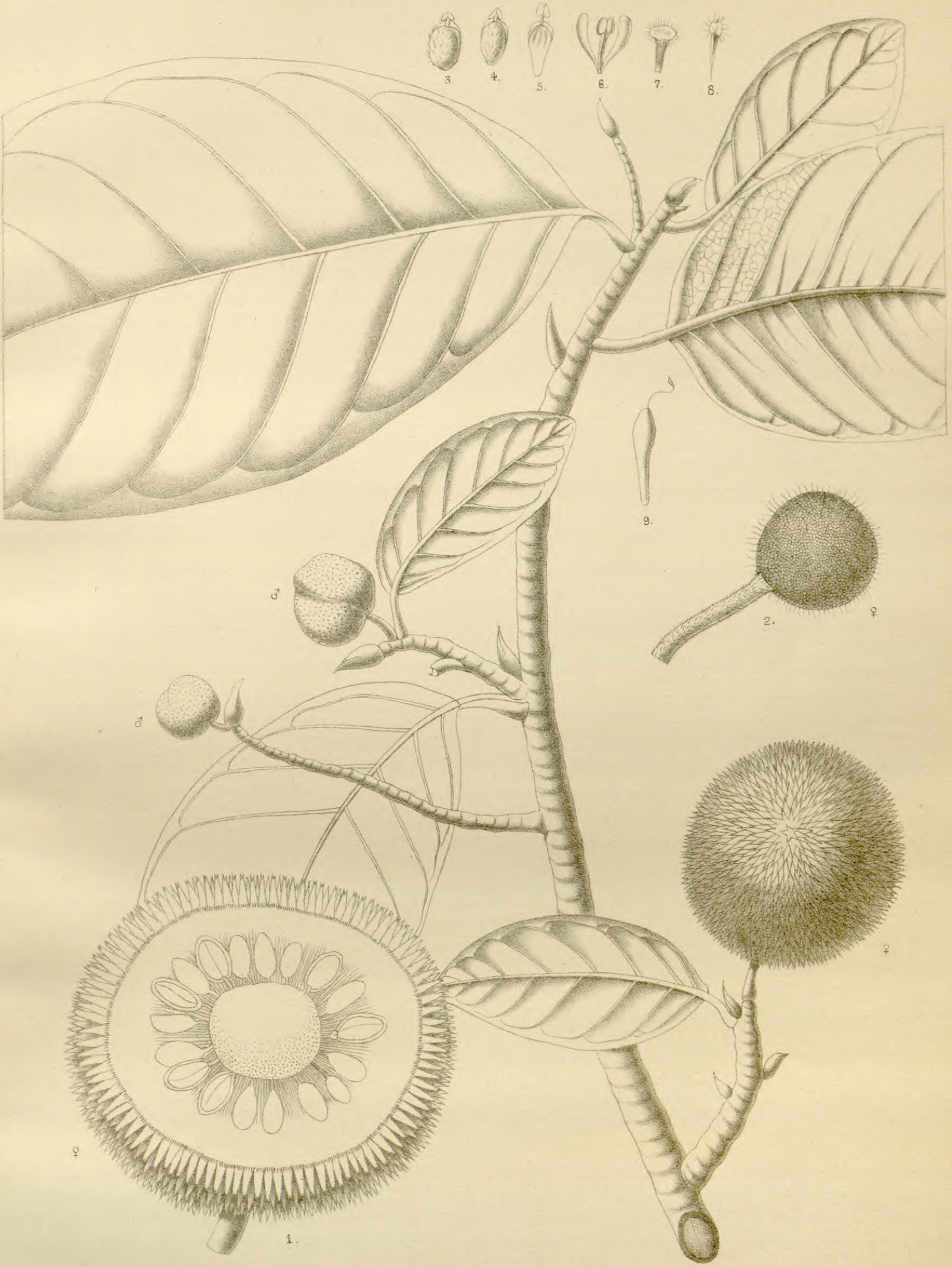
ARTOCARPUS CALOPHYLLA, Kurz.

PLATE 3.



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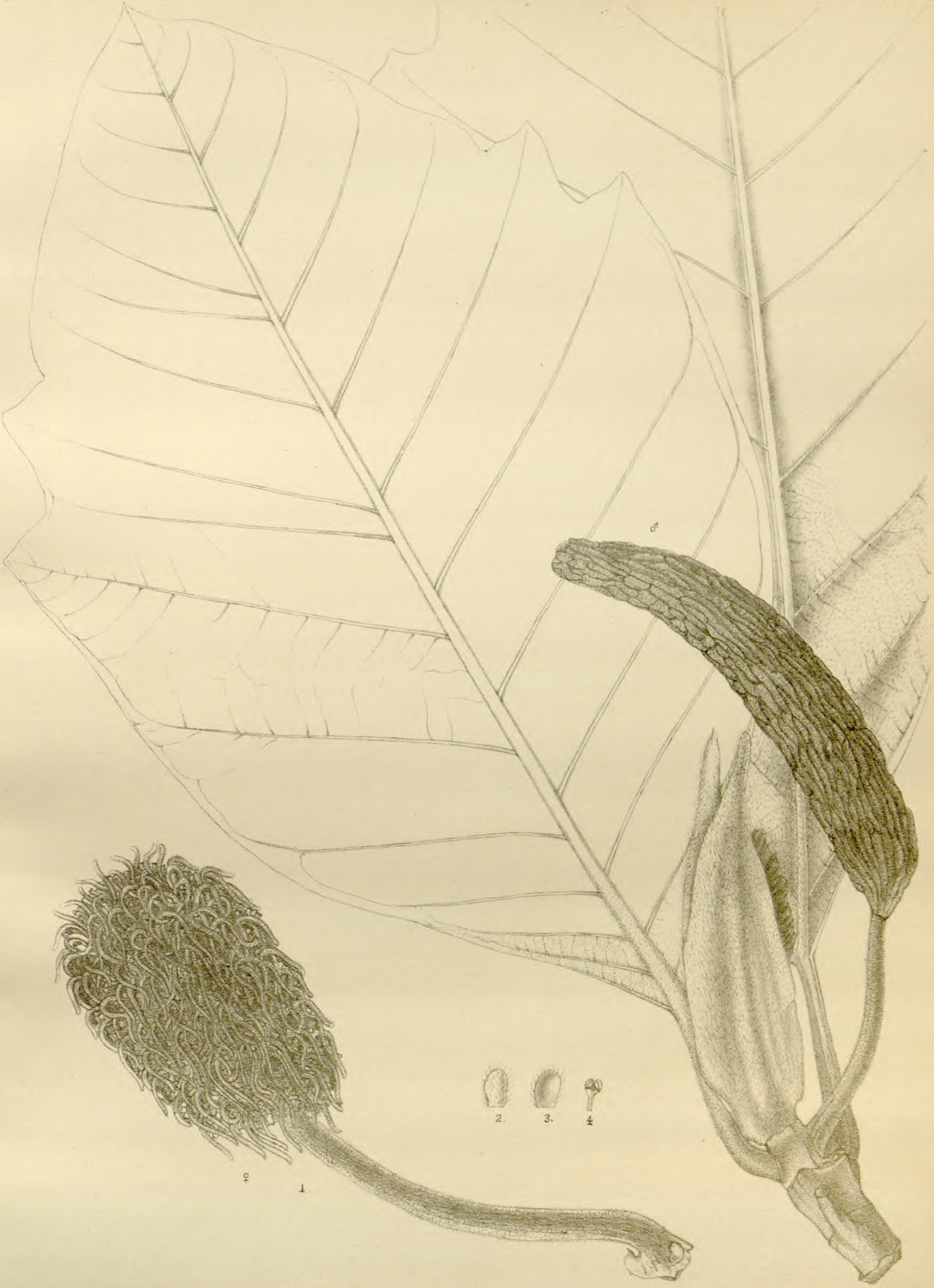
ARTOCARPUS RIGIDA, Blume.



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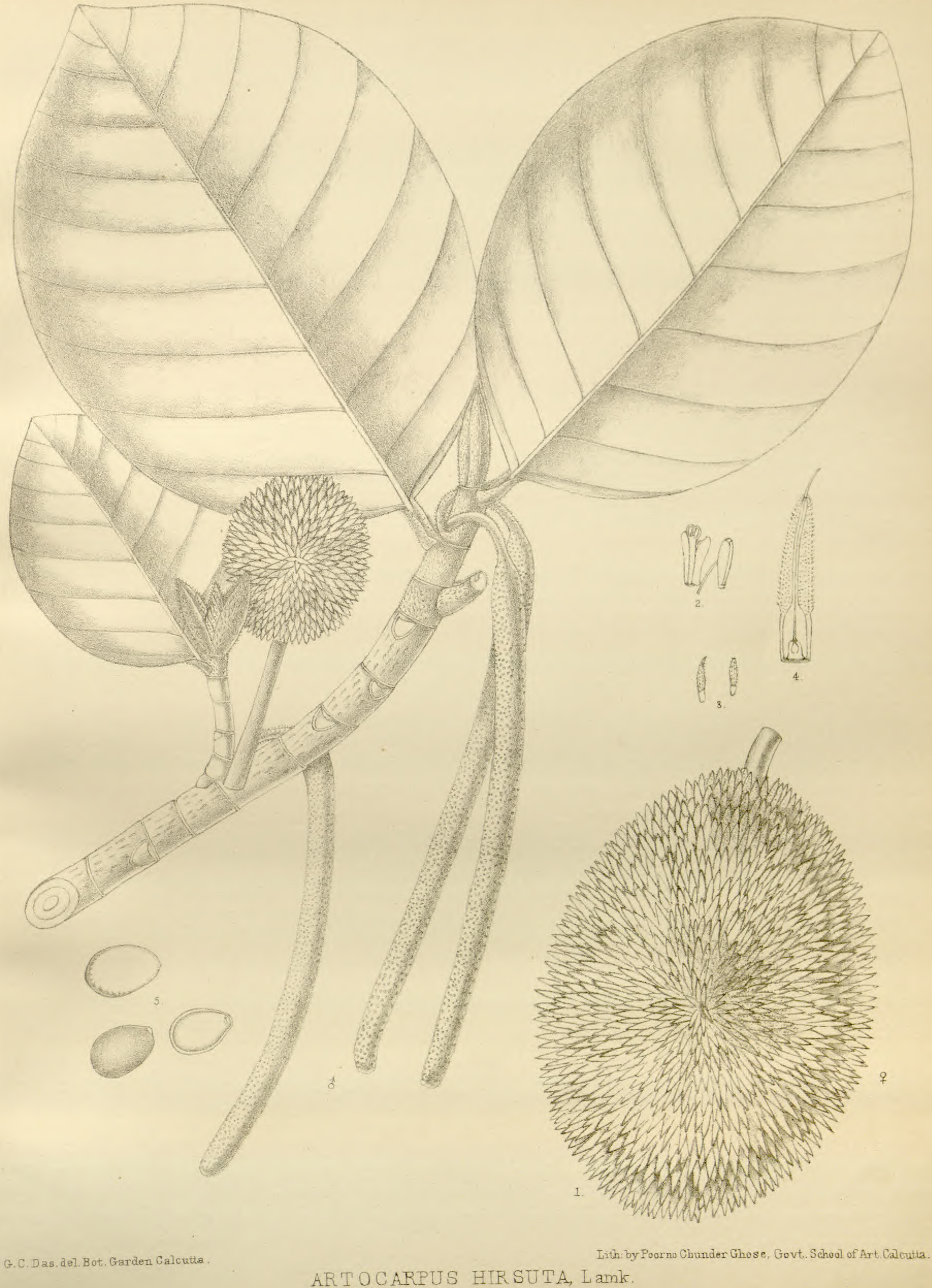
ARTOCARPUS KUNSTLERI, King.



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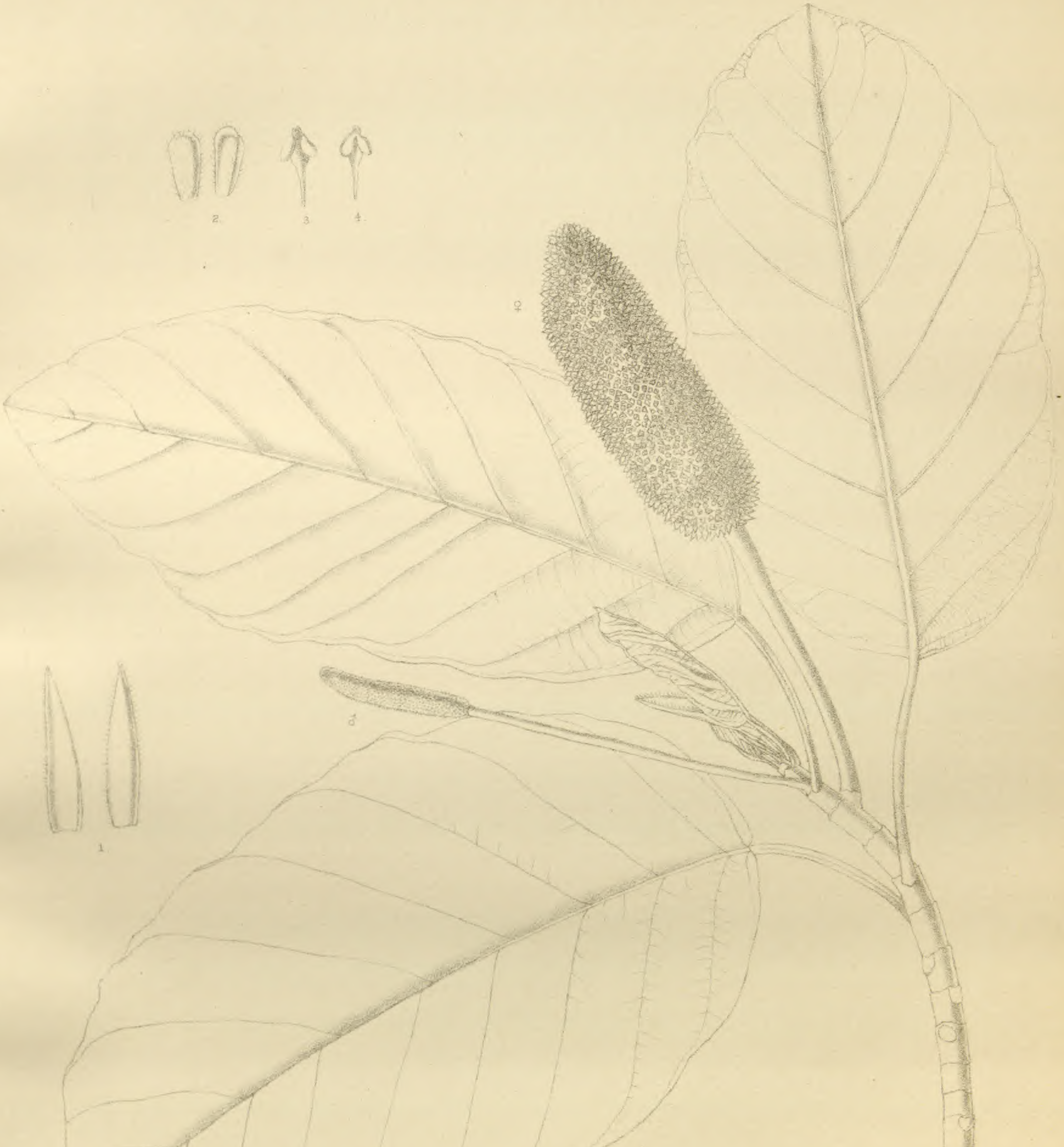
ARTOCARPUS HIRSUTA, Lamk.



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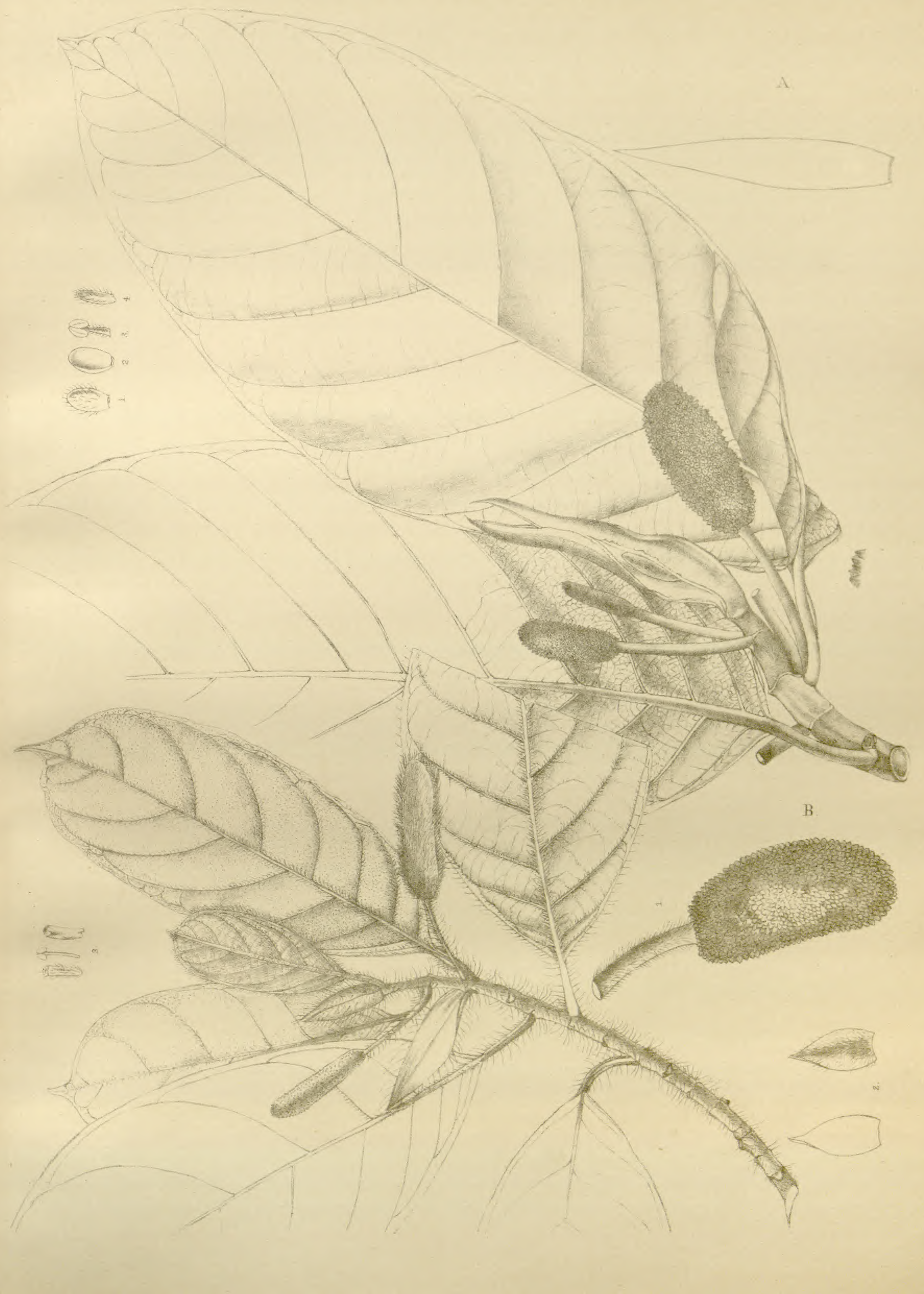
ARTOCARPUS PEDUNCULARIS, Kurz.



ARTOCARPUS LOWII, King.

ARTOCARPUS POLYPHEMA, Pers.

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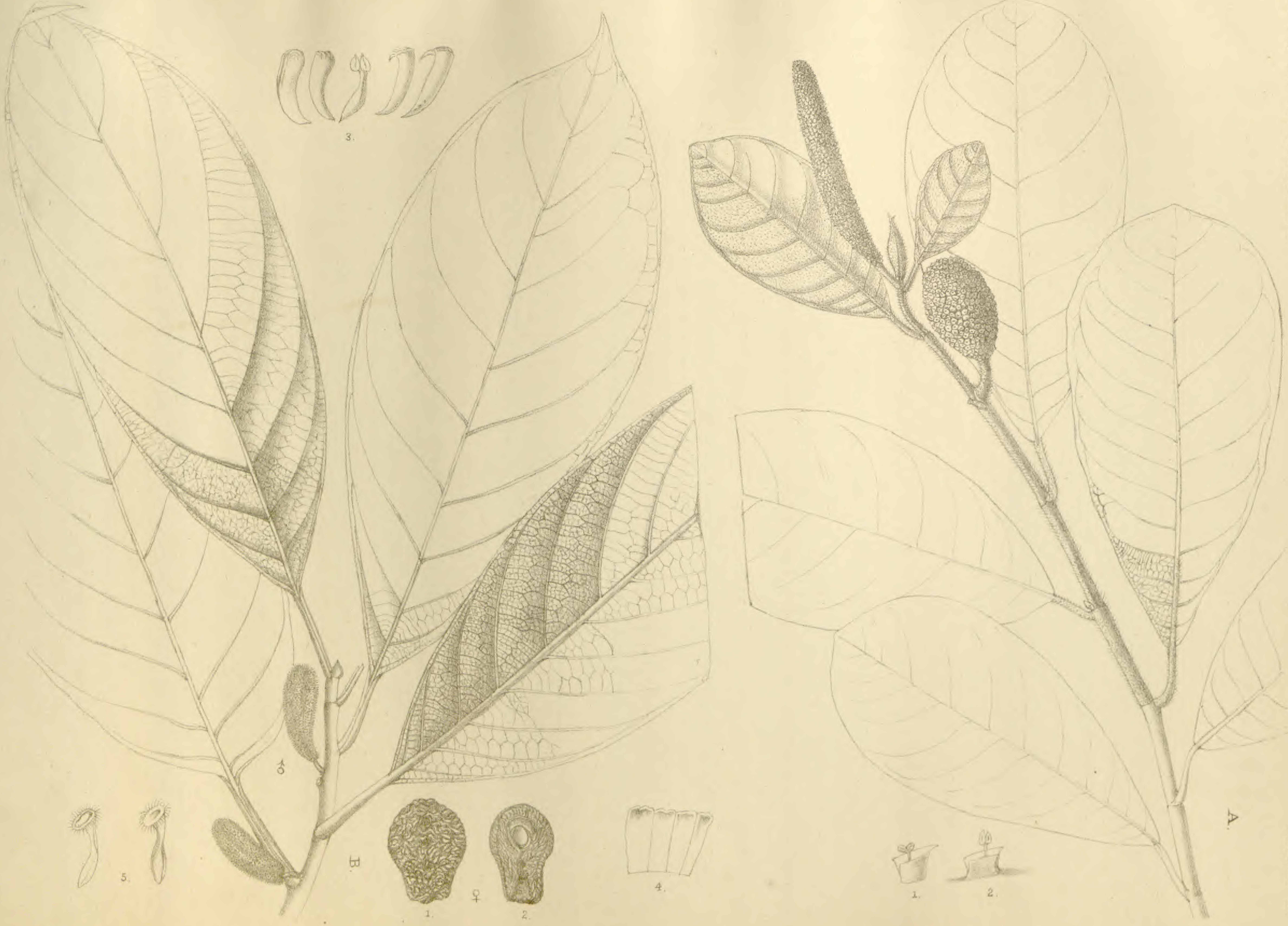

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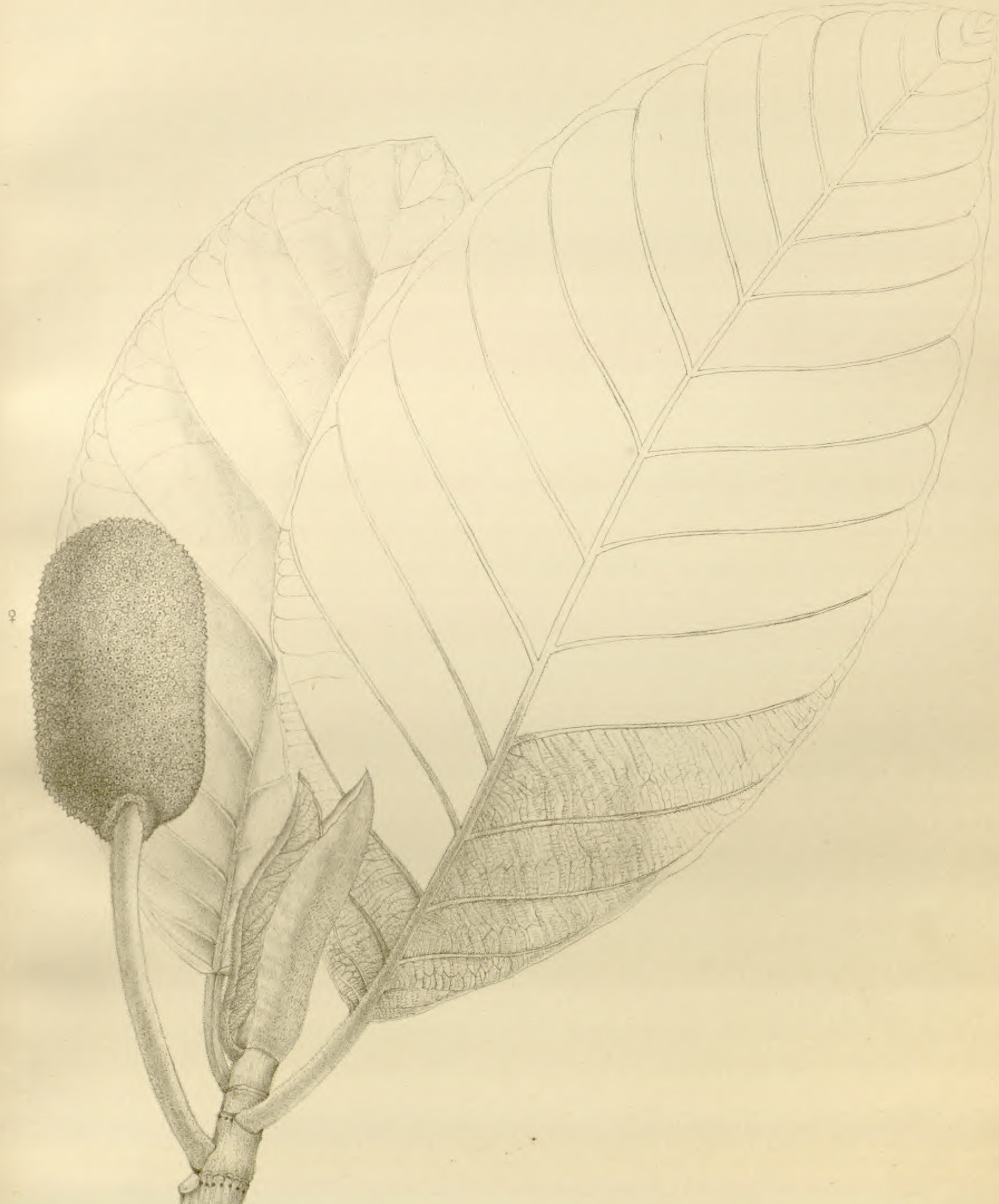
ARTOCARPUS DENISONIANA, King.   ARTOCARPUS MAINGAYI, King.



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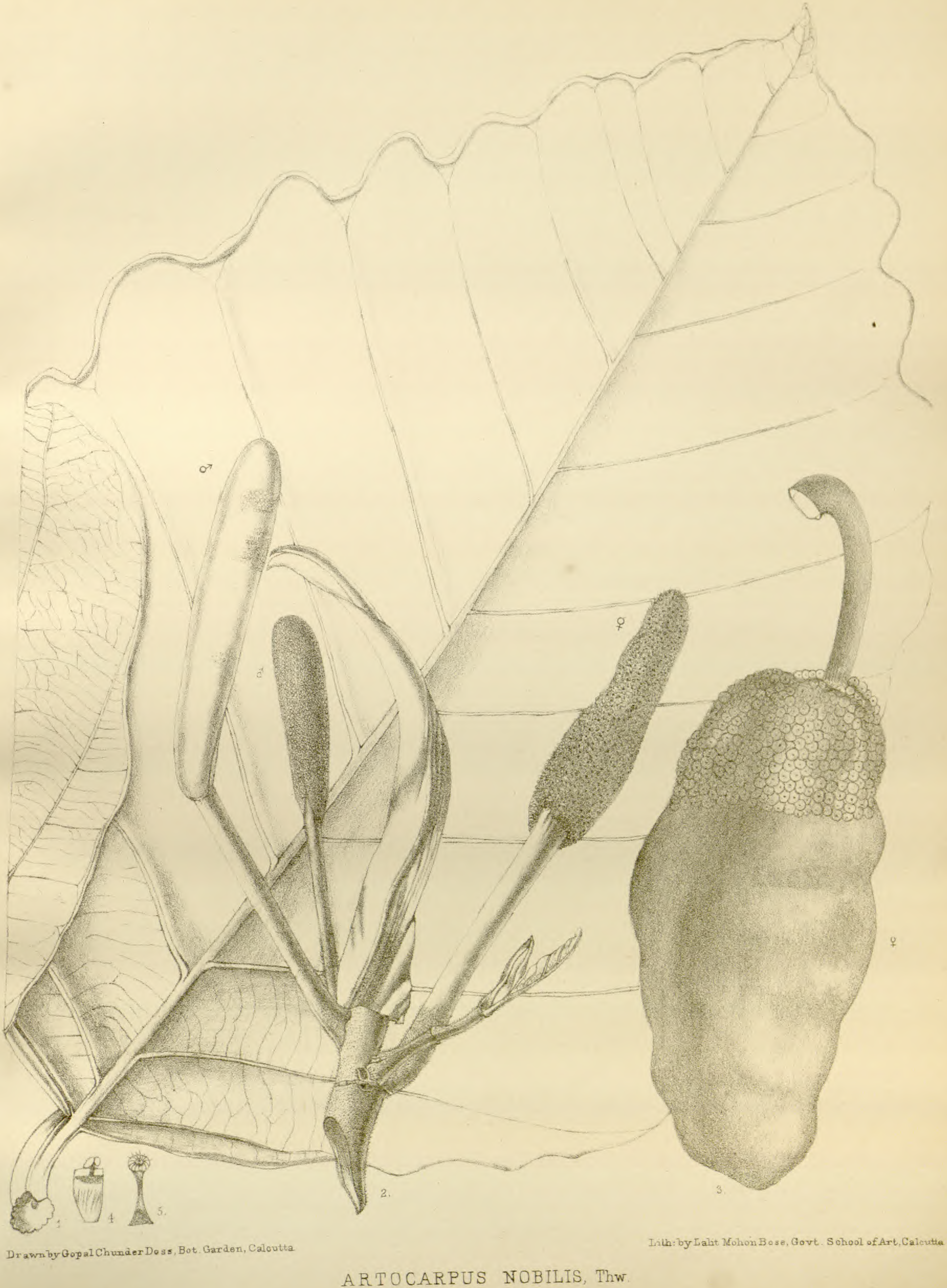
ARTOCARPUS SCORTECHINII. King.



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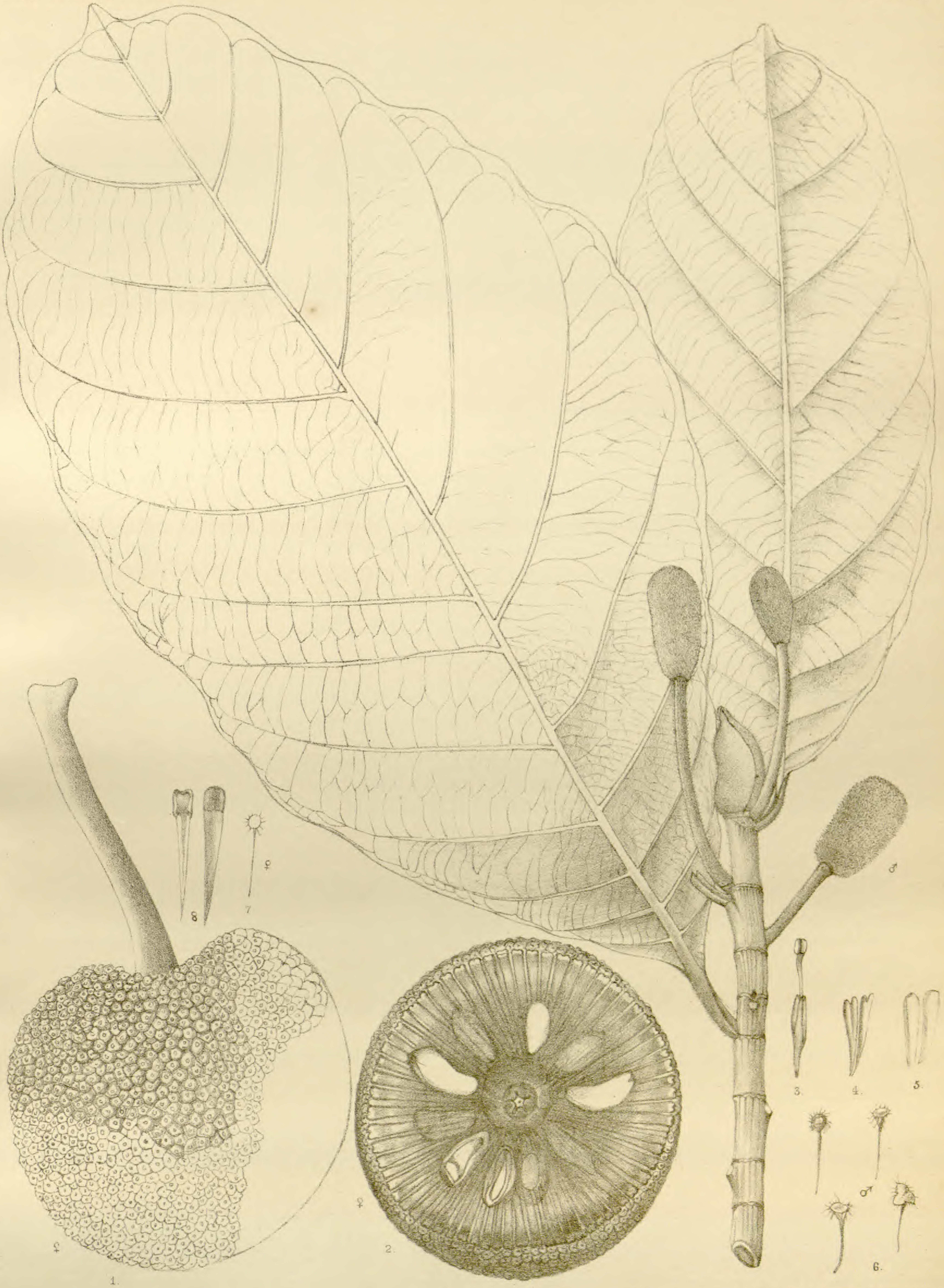
ARTOCARPUS NOBILIS, Thw.



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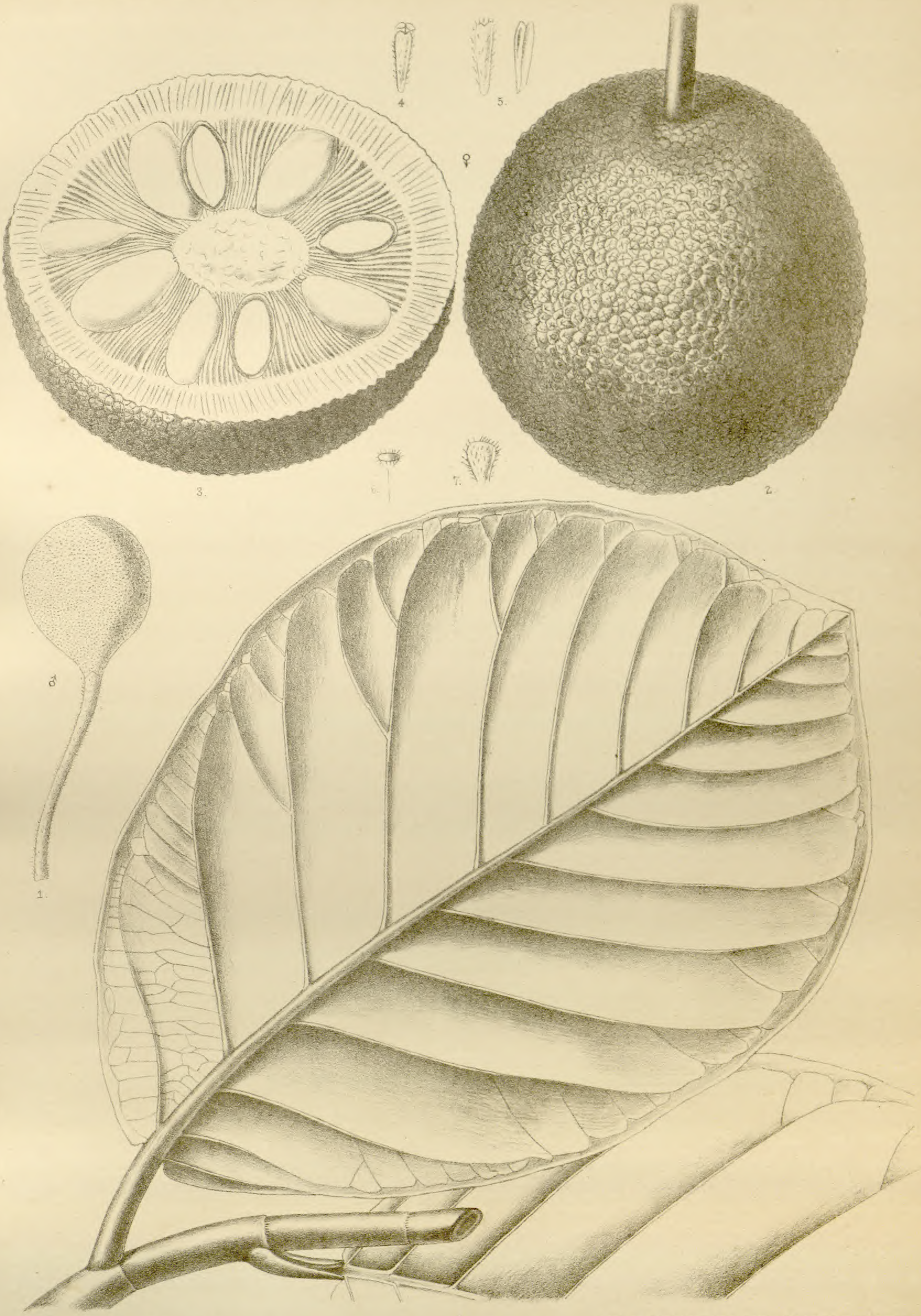
ARTOCARPUS LANCEAEFOLIA. Roxb.



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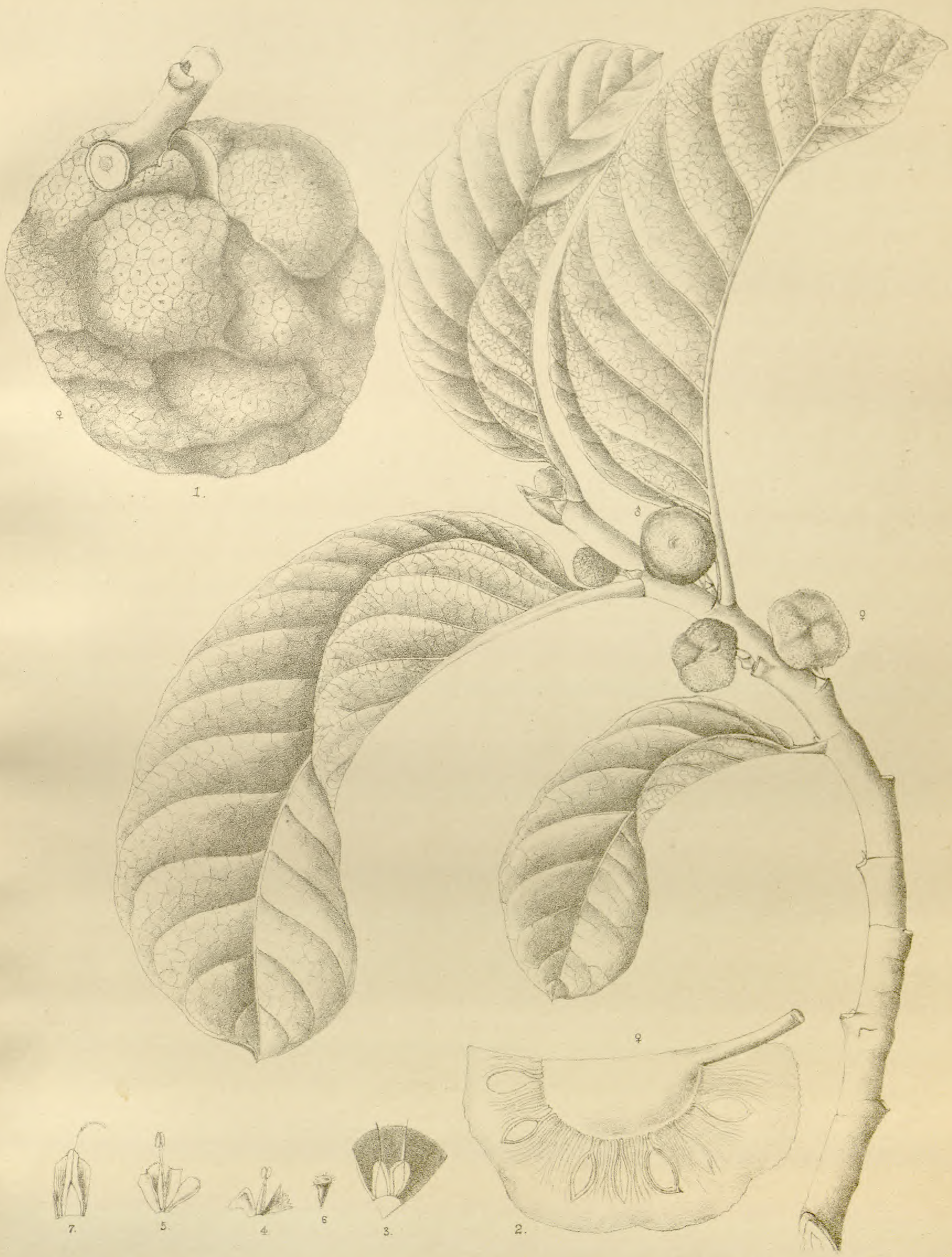
ARTOCARPUS CHAPLASHA, Roxb.



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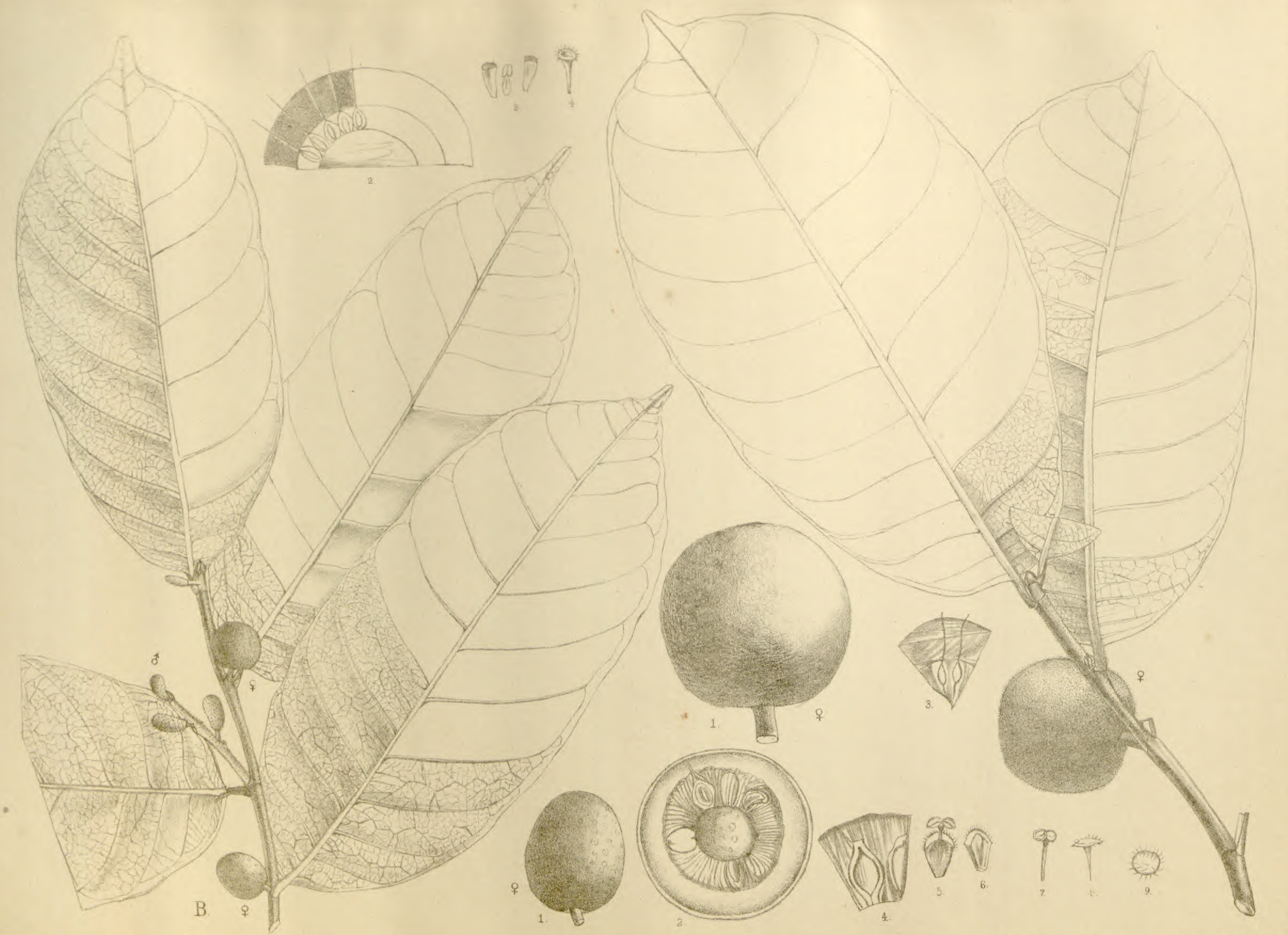
ARTOCARPUS LAKOOCHA, Roxb.



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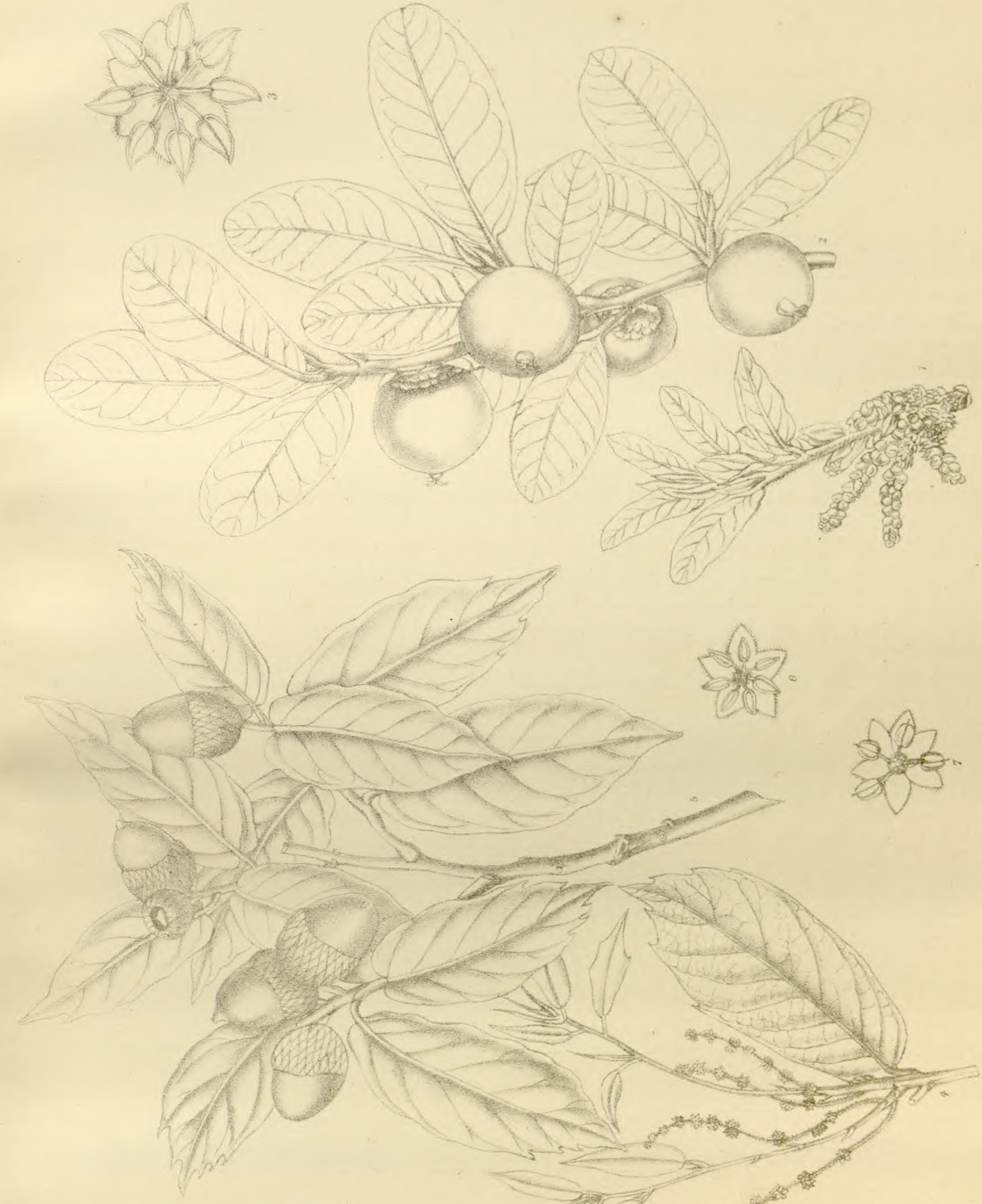
B. ARTOCARPUS GOMEZIANA, Wall. var. Griffithii.

A. ARTOCARPUS GOMEZIANA, Wall.



QUERCUS SEMECARPIFOLIA, Smith.

QUERCUS DILATATA, Lindl.

G. C. Das del Bot. Garden Calcutta.

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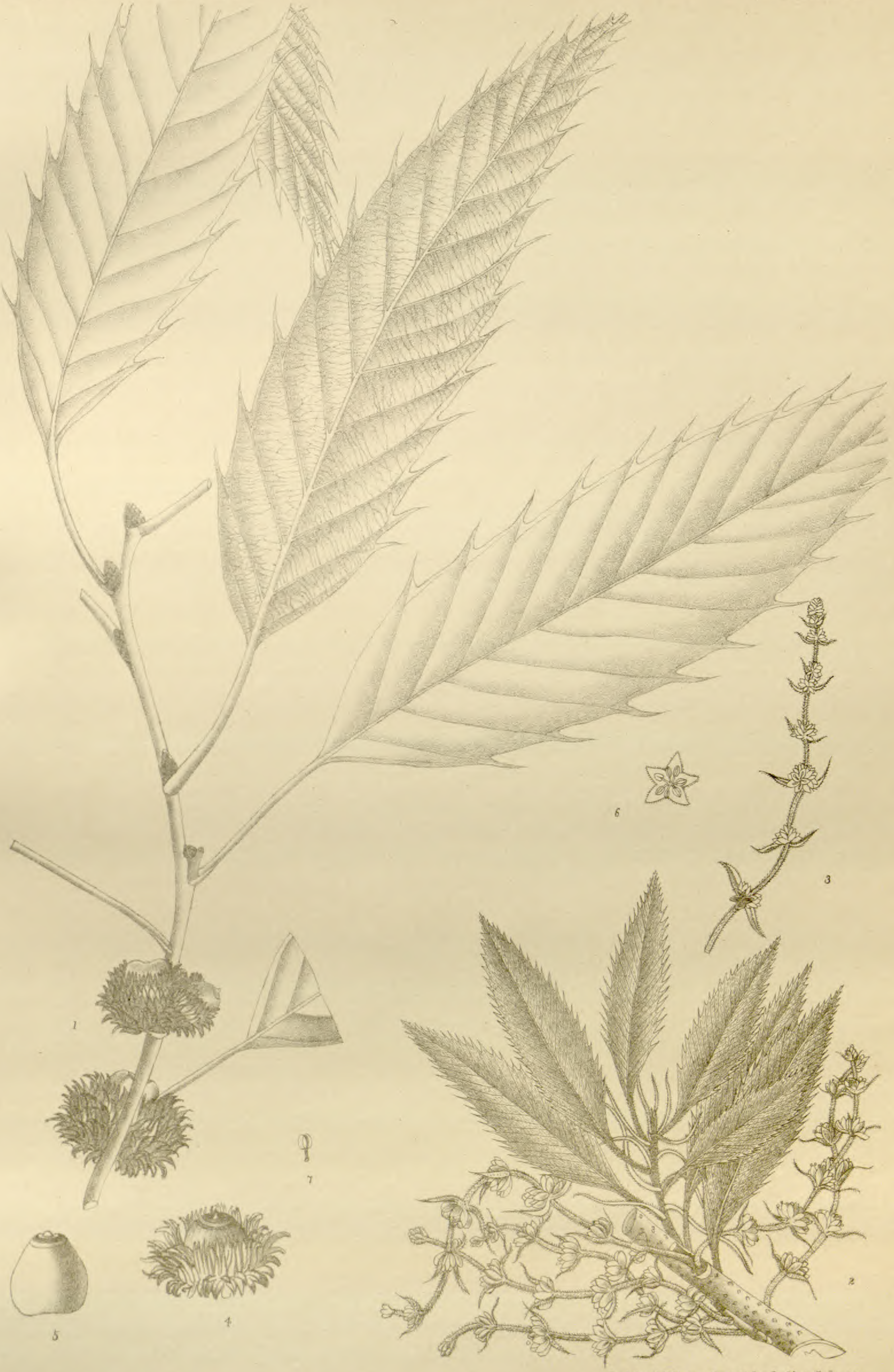

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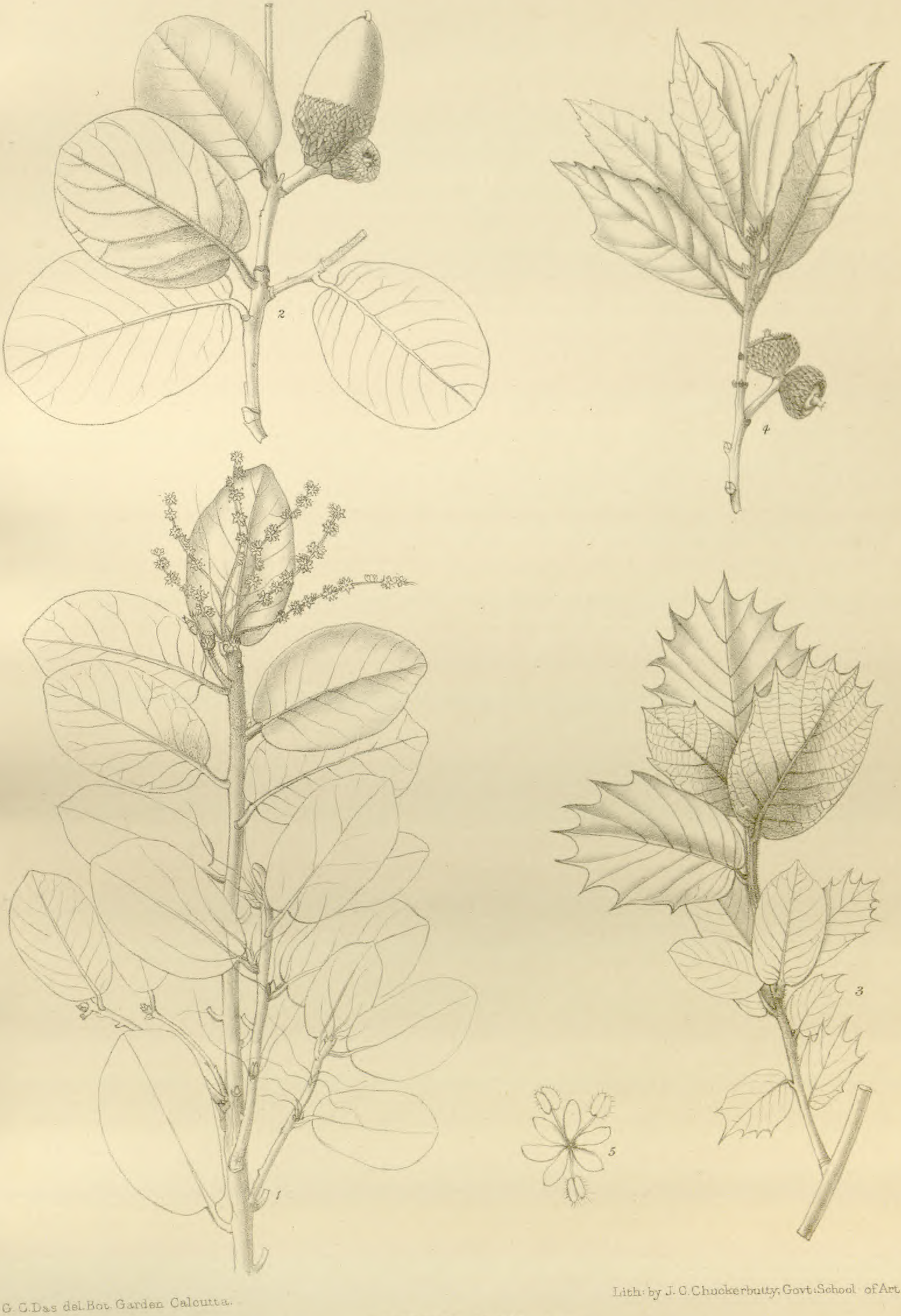
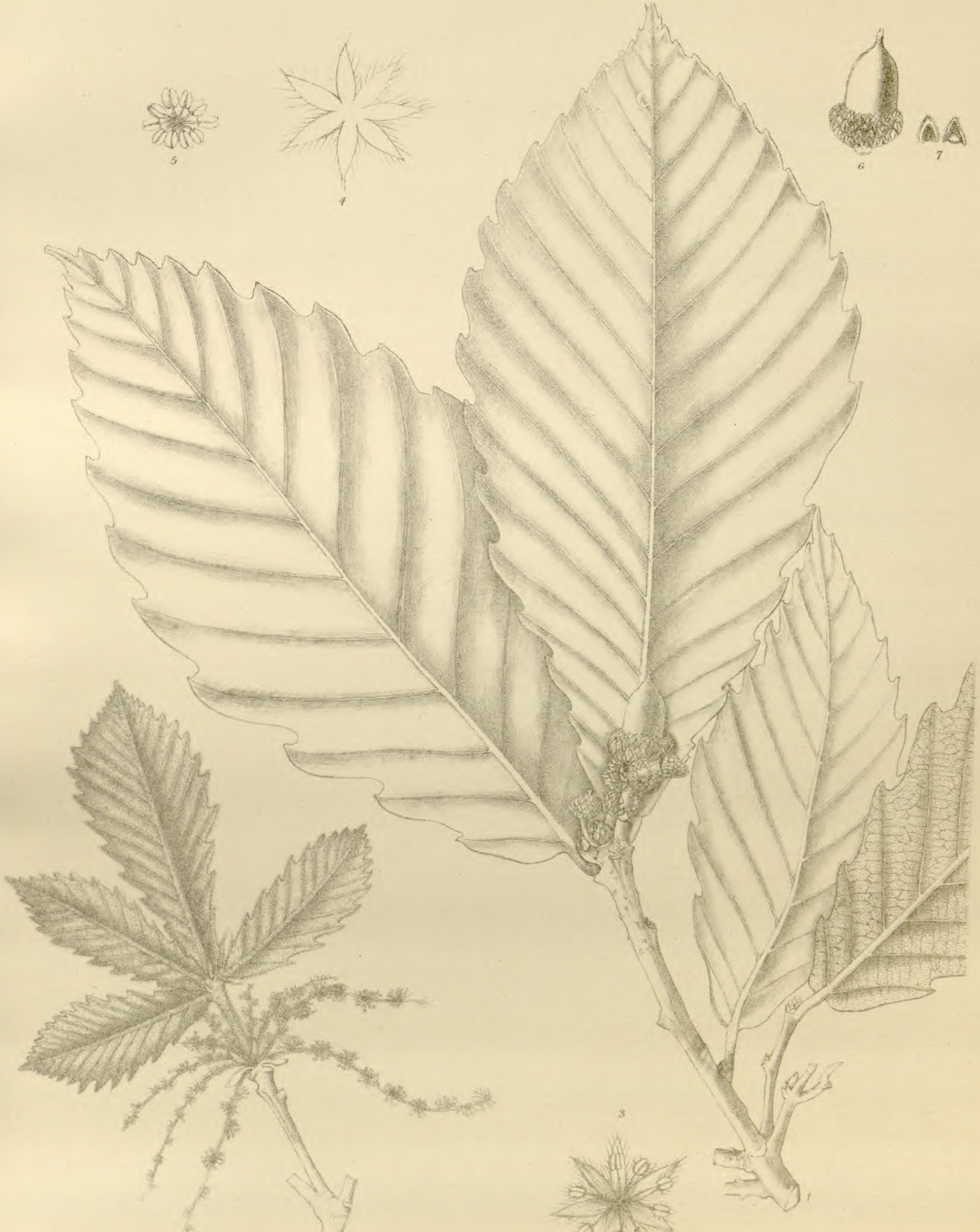
Lith by H. C. Datta, Govt. School of Art Calcutta

QUERCUS SERRATA, THUNB. VAR. ROXBURGHII. DC.



G. C. Das del. Bot. Garden Calcutta.
Lith: by J. C. Chuckerbutty, Govt: School of Art, Calcutta.

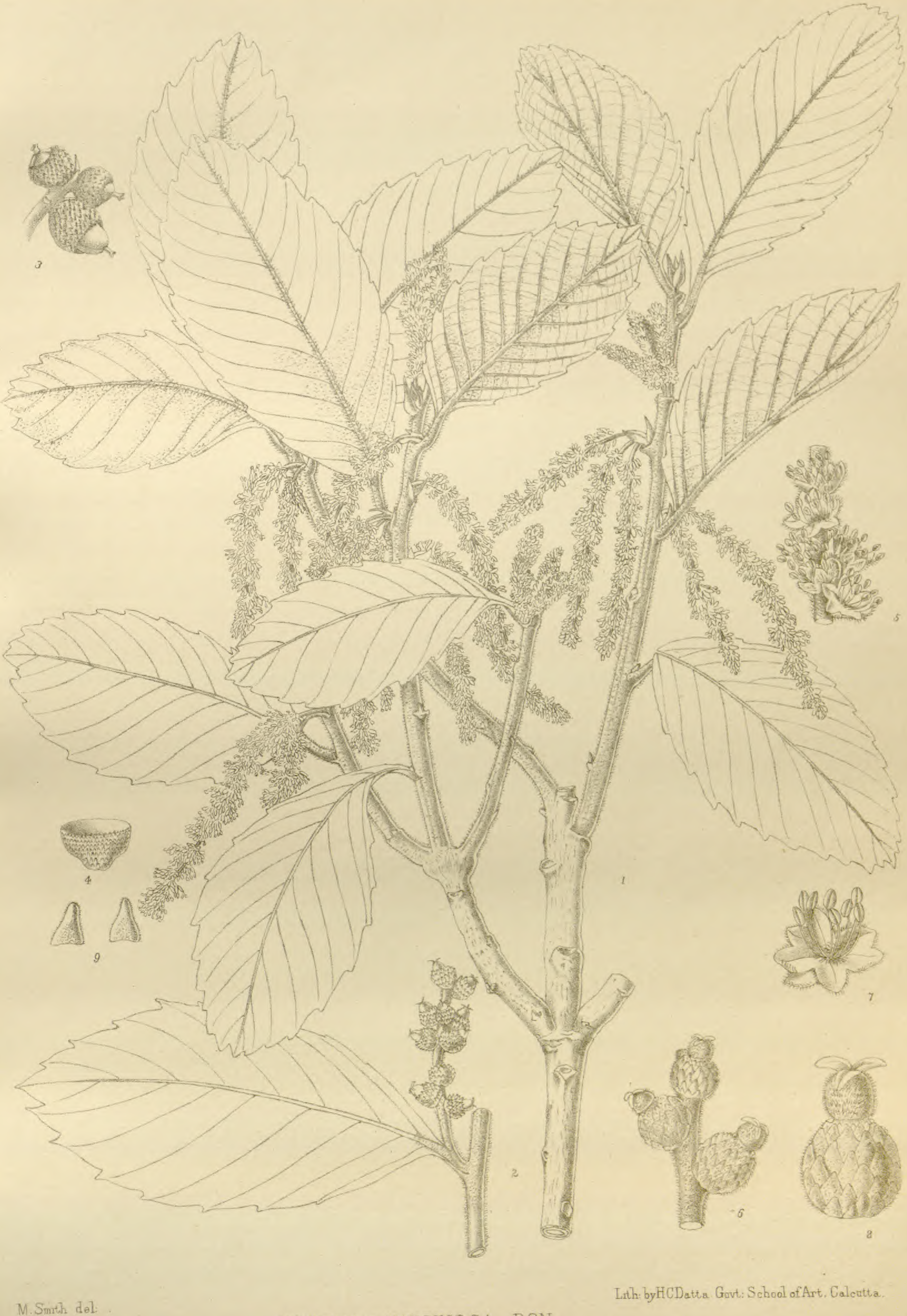
QUERCUS ILEX, Linn.



G. C. Das del. Bot. Garden, Calcutta.

Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

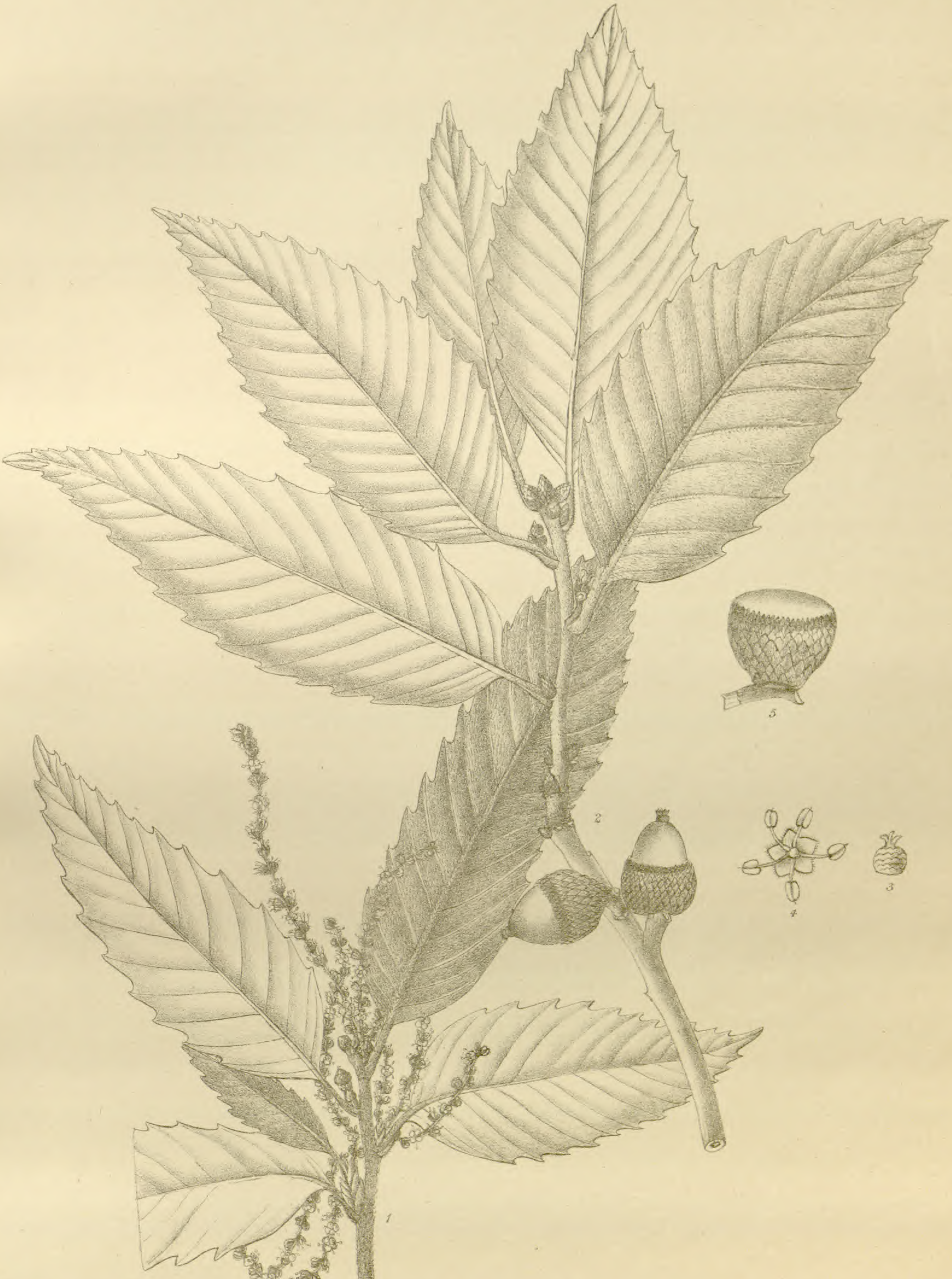
QUERCUS GRIFFITHII, Hook. fil. et Thoms.



M. Smith del.

Lith: by H C Datta. Govt: School of Art, Calcutta.

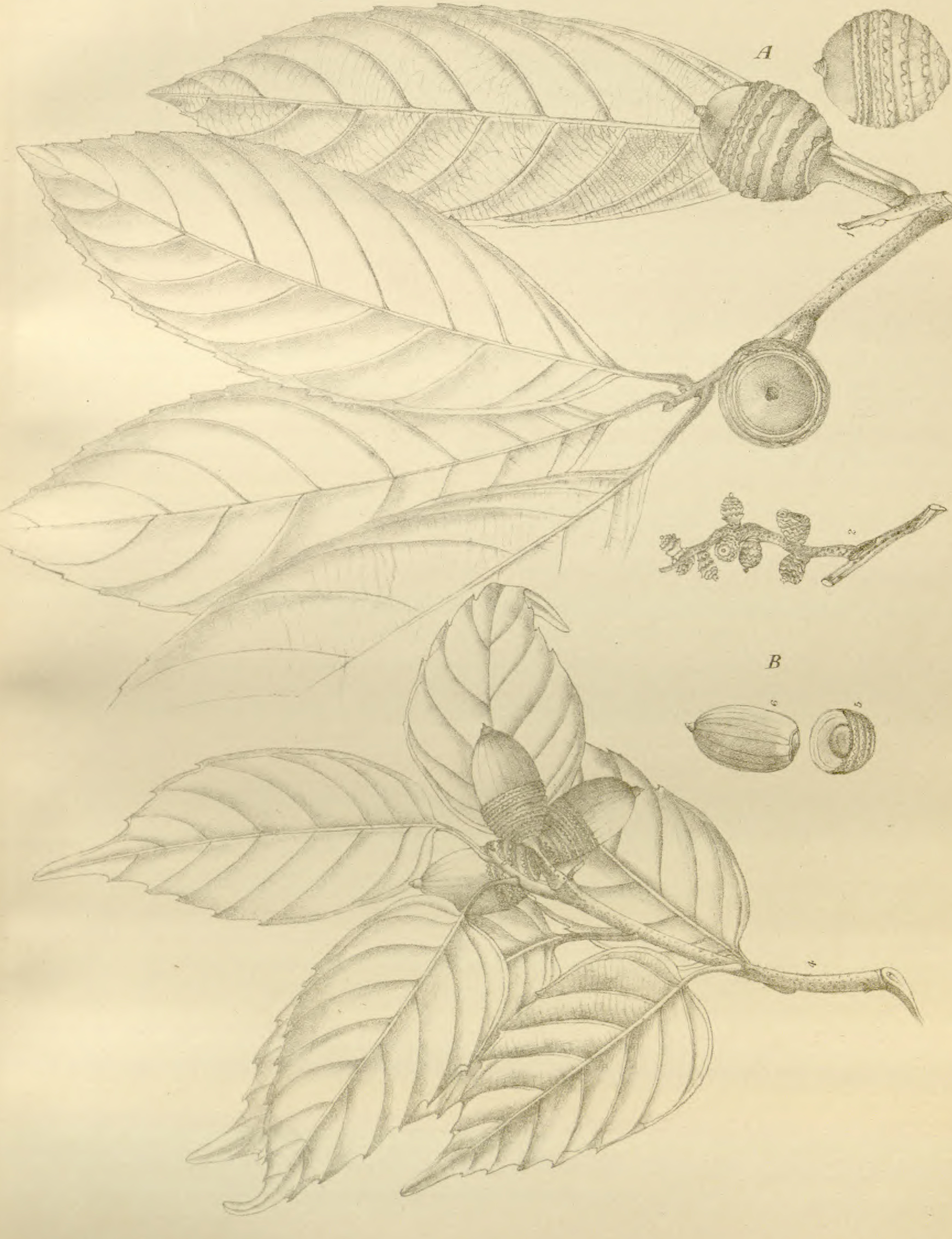
QUERCUS LANUGINOSA, DON.



G. C. Das del. Bot. Garden, Calcutta.

Lith. by J. K. Bhattacharjya, Govt. School of Art, Calcutta.

QUERCUS INCANA, Roxb.

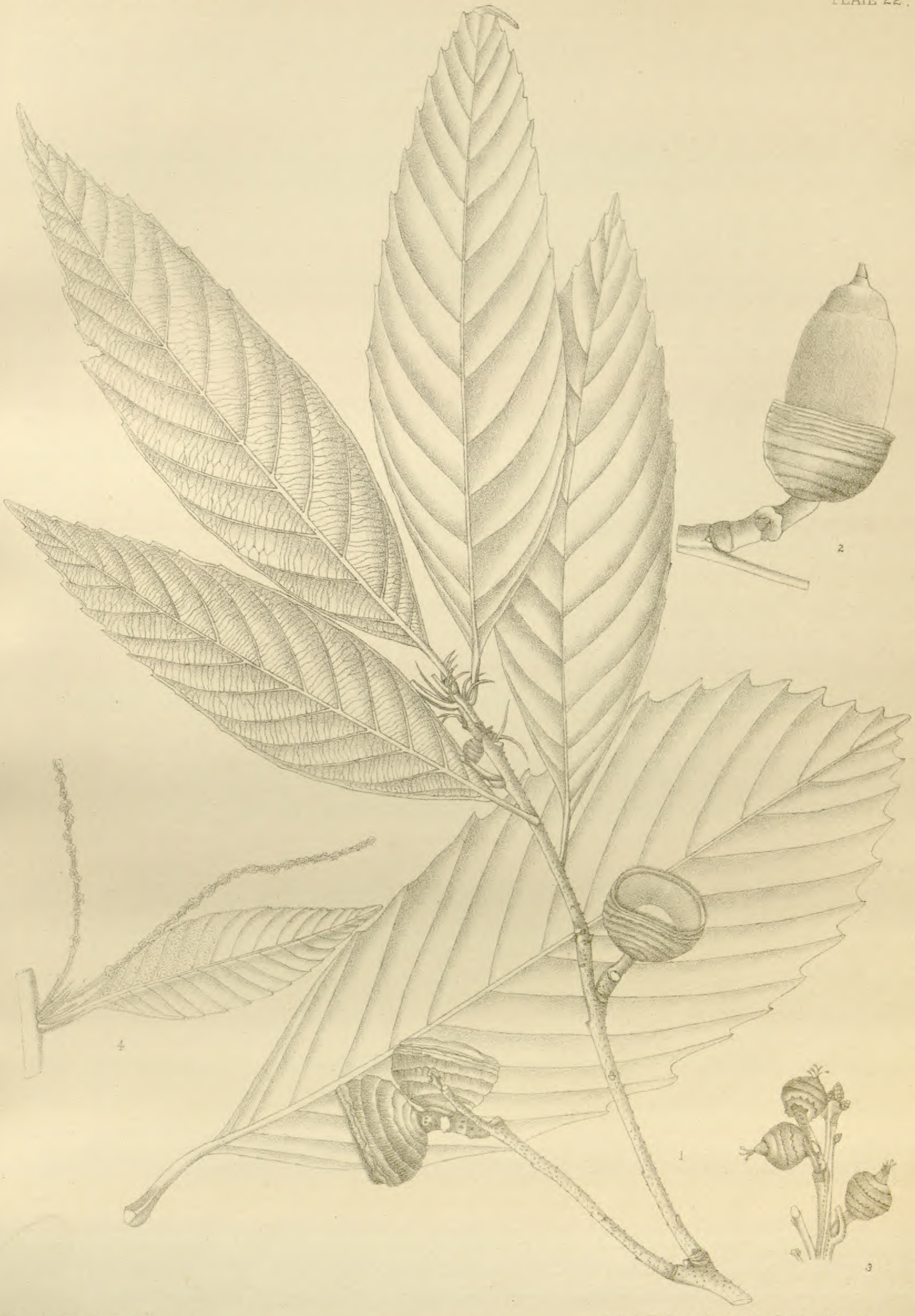


Lith. by J.C. Chuckerbutty, Govt. School of Art, Calcutta.

QUERCUS OIDOCARPA, Korth.

QUERCUS LOWII, King.

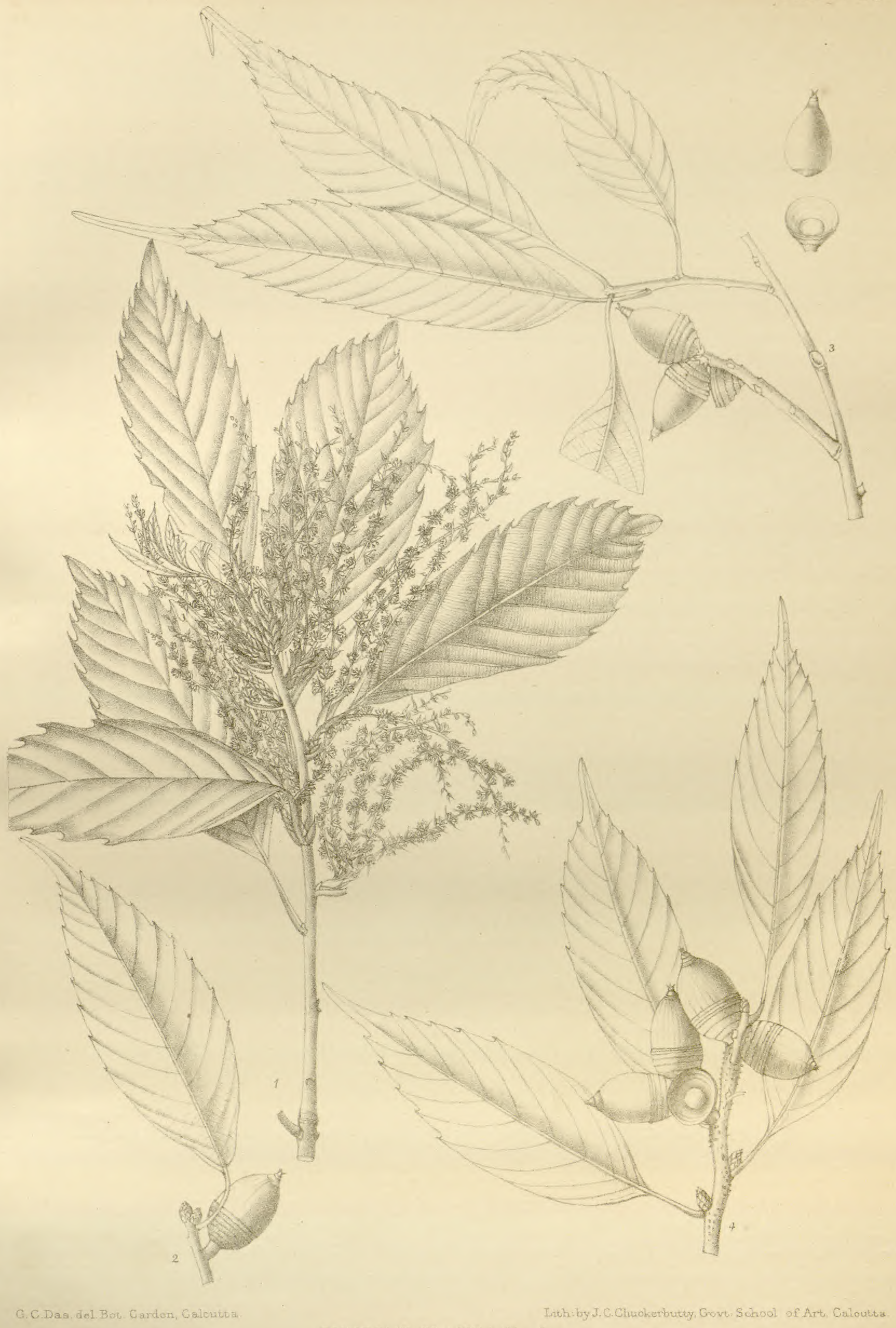
G. C. Das del. Bot Garden, Calcutta.



G. C. Das del. Bot. Garden Calcutta.

Lith. by H. C. Datta, Govt. School of Art Calcutta.

QUERCUS SEMI-SERRATA, ROXB.

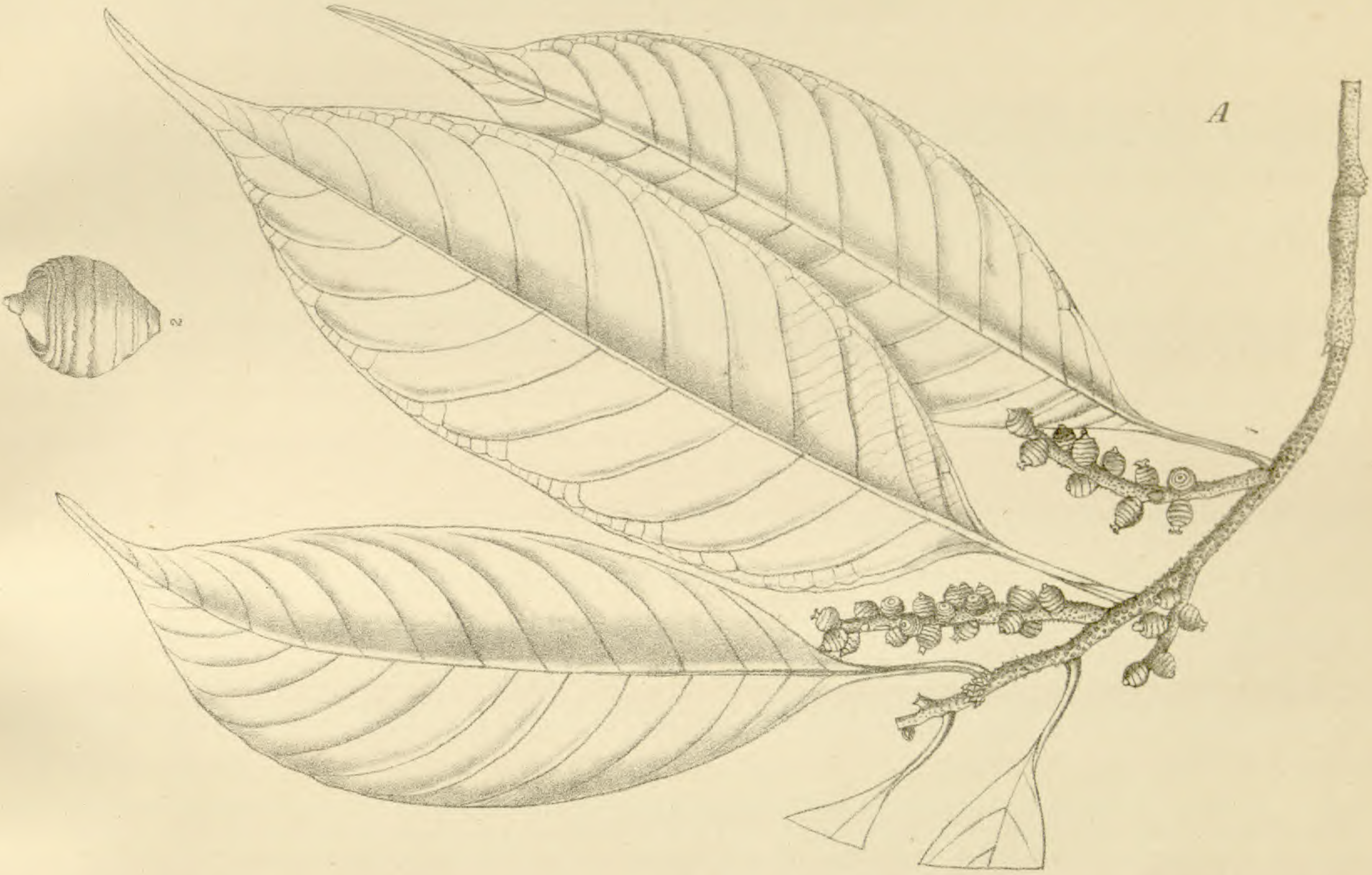


G. C. Das. del. Bot. Garden, Calcutta.

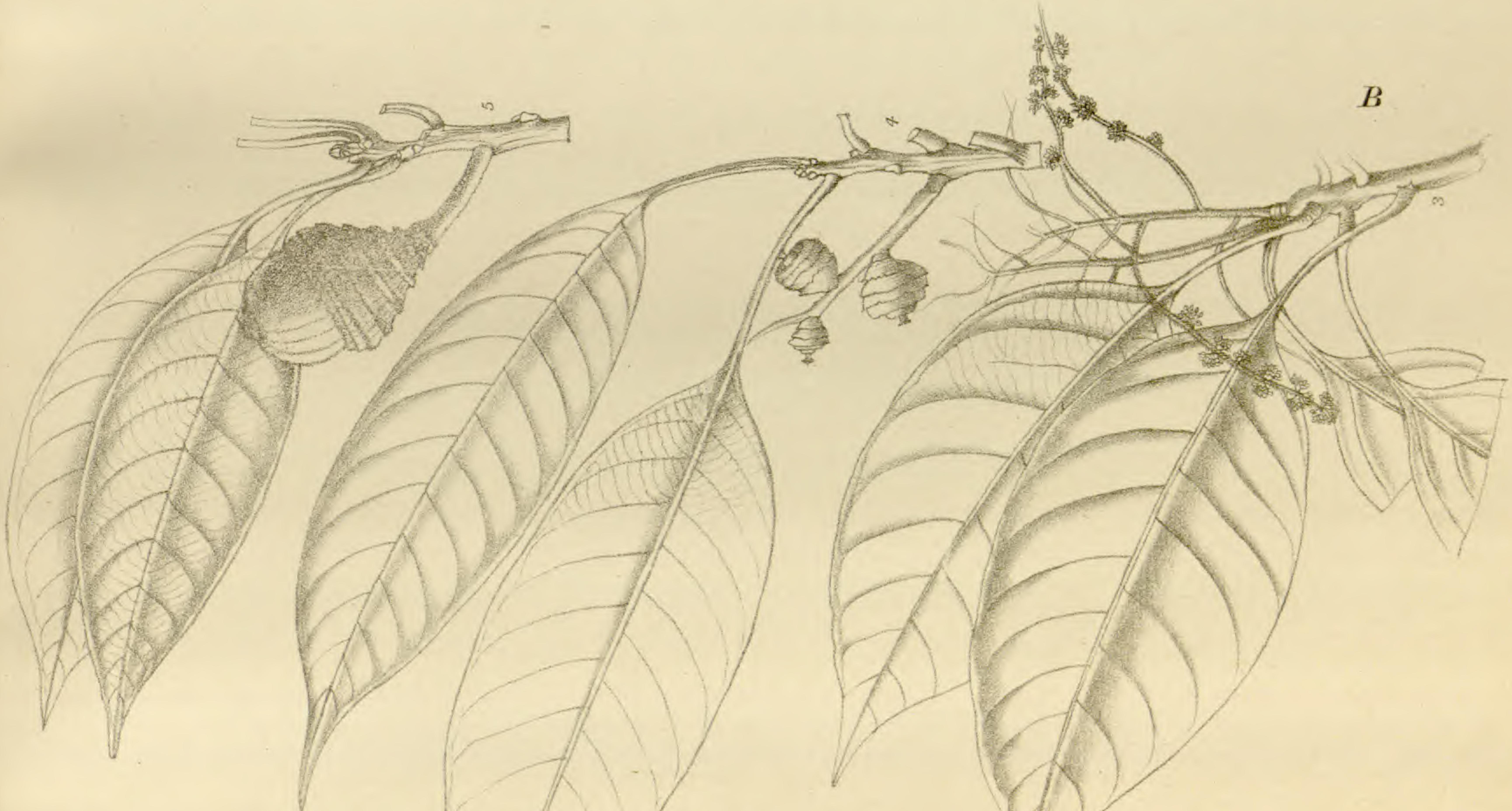
Lith: by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

QUERCUS GLAUCA, Thunbg.

PLATE 24.

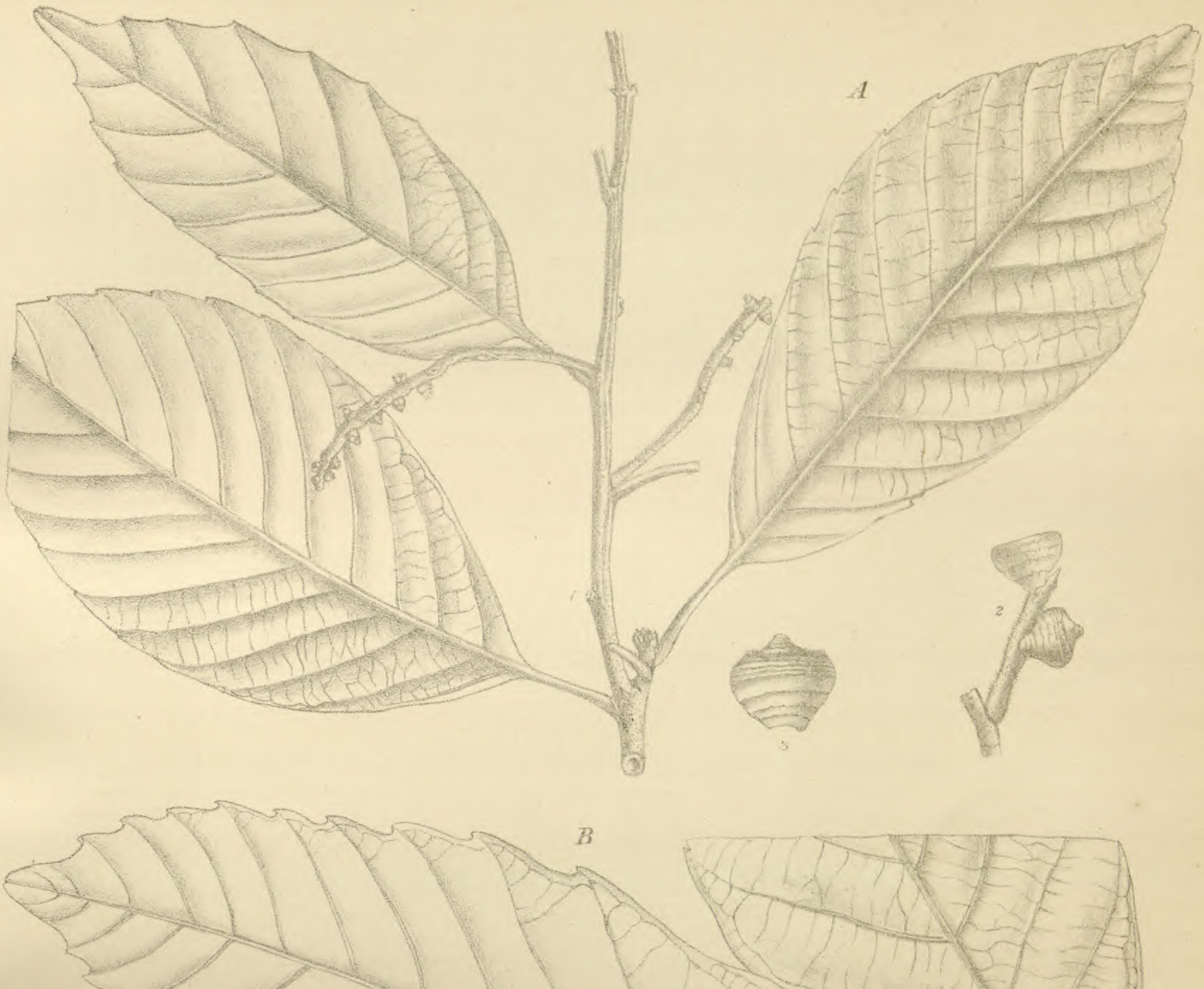


QUERCUS ARGENTATA, Korth.



QUERCUS NIVEA, King.

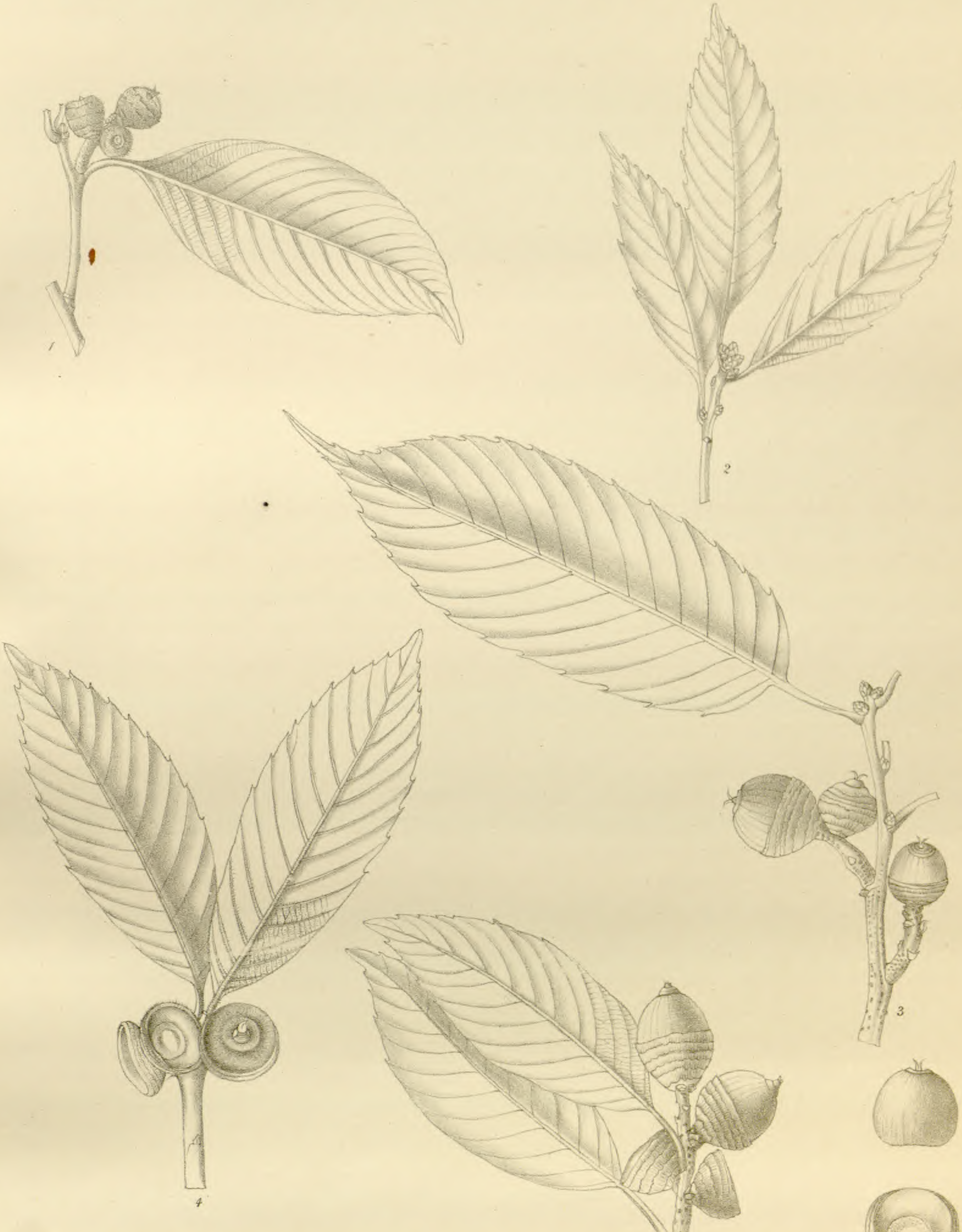
G. C. Das del. Bot. Garden Calcutta.
Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.



G.C. Das del. Bot. Garden Calcutta.

Lith. by J. Chuckerbutty Govt. School of Art. Calcutta.

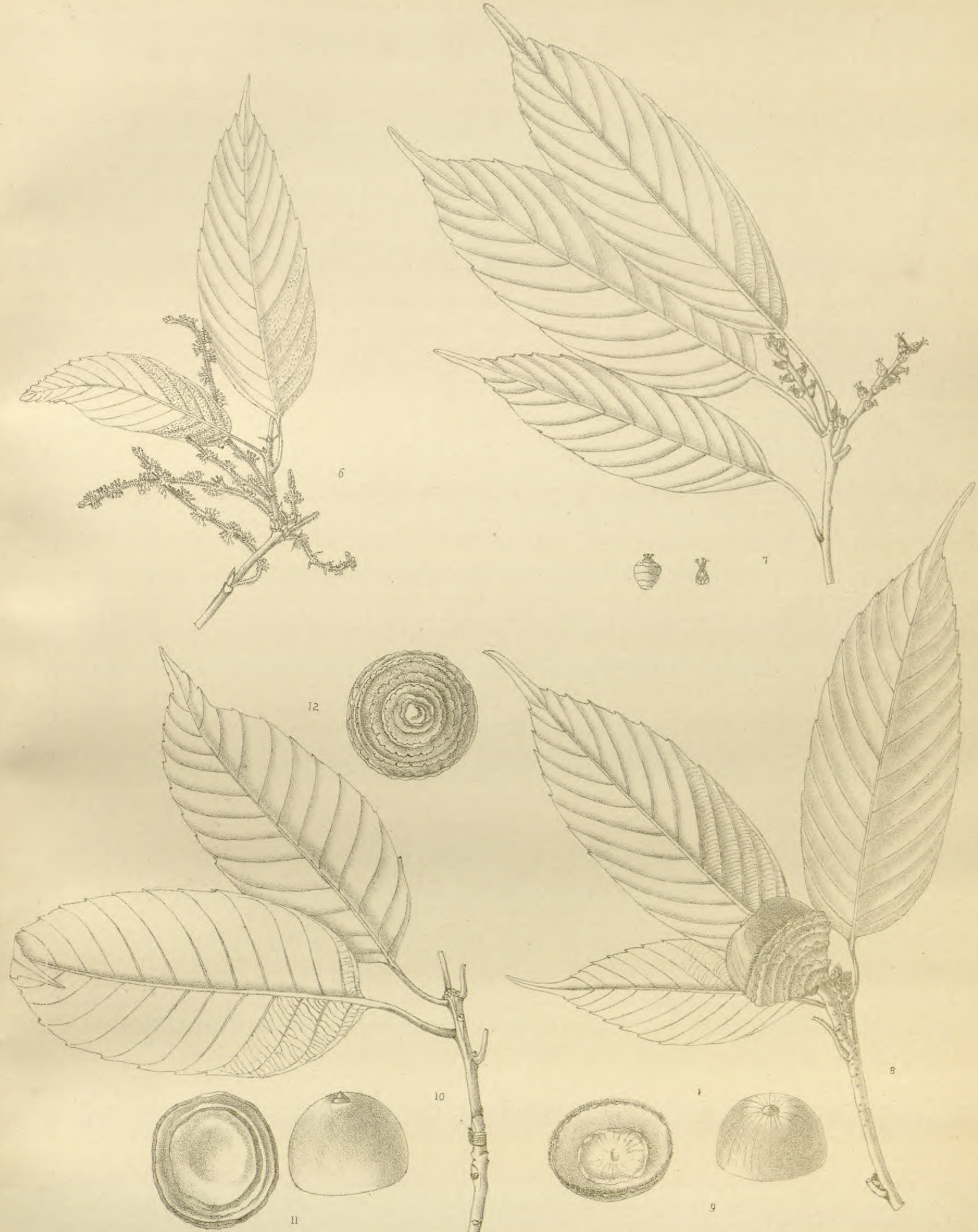
A. QUERCUS BRANDISIANA, Kurz.
B. " HELFERIANA, DC.



G. C. Das del. Bot. Garden Calcutta.
Lith: by J. C. Chuckerbutty. Govt. School of Art, Calcutta.

QUERCUS LINEATA, Blume.

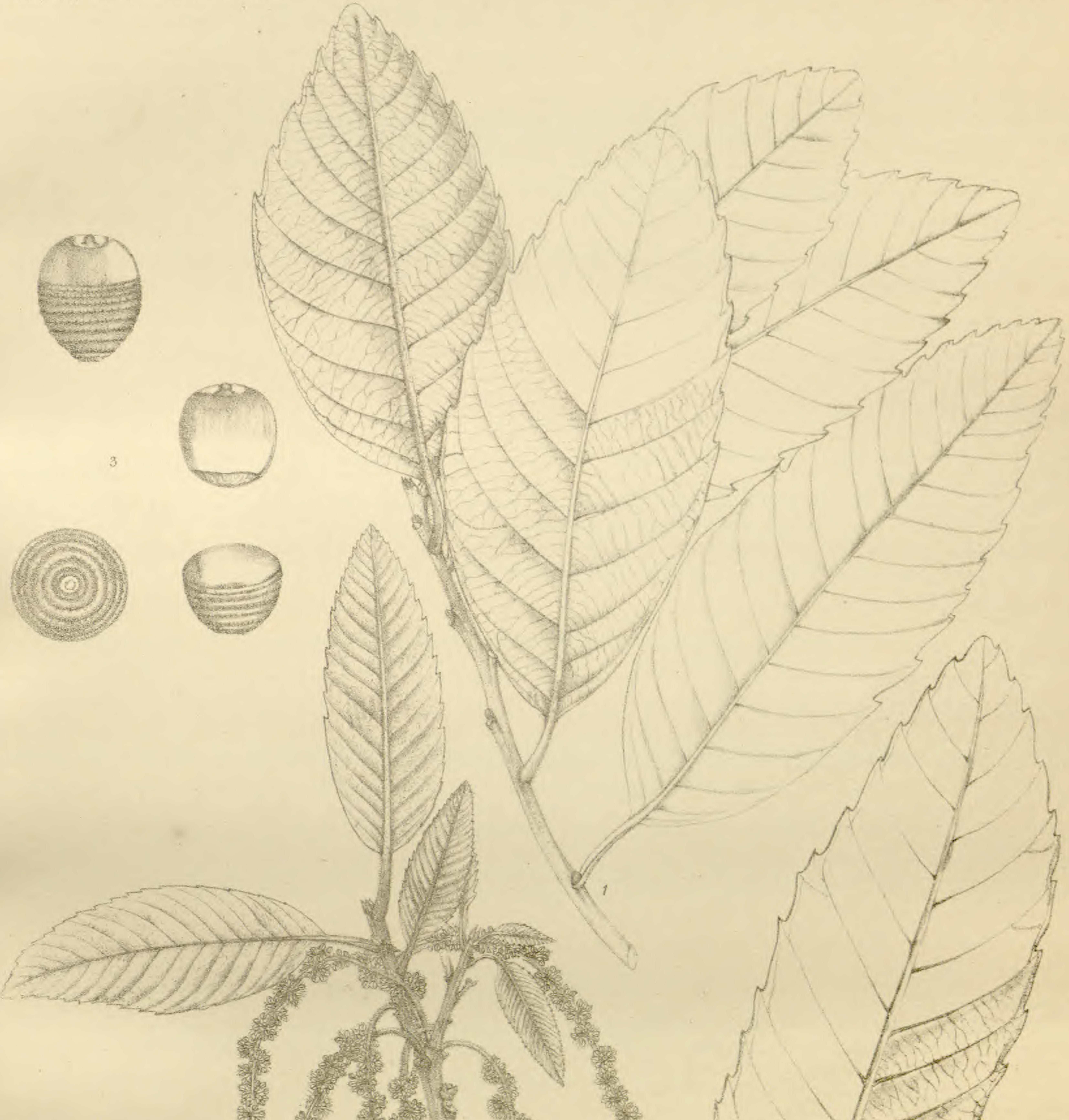
1. Typical form. 2. Var. Merkusii. 3. Var. Oxyodon. 4. Var. Lobbii. 5. Var. Griffithii.



G.C.Das del. Bot: Garden Calcutta.

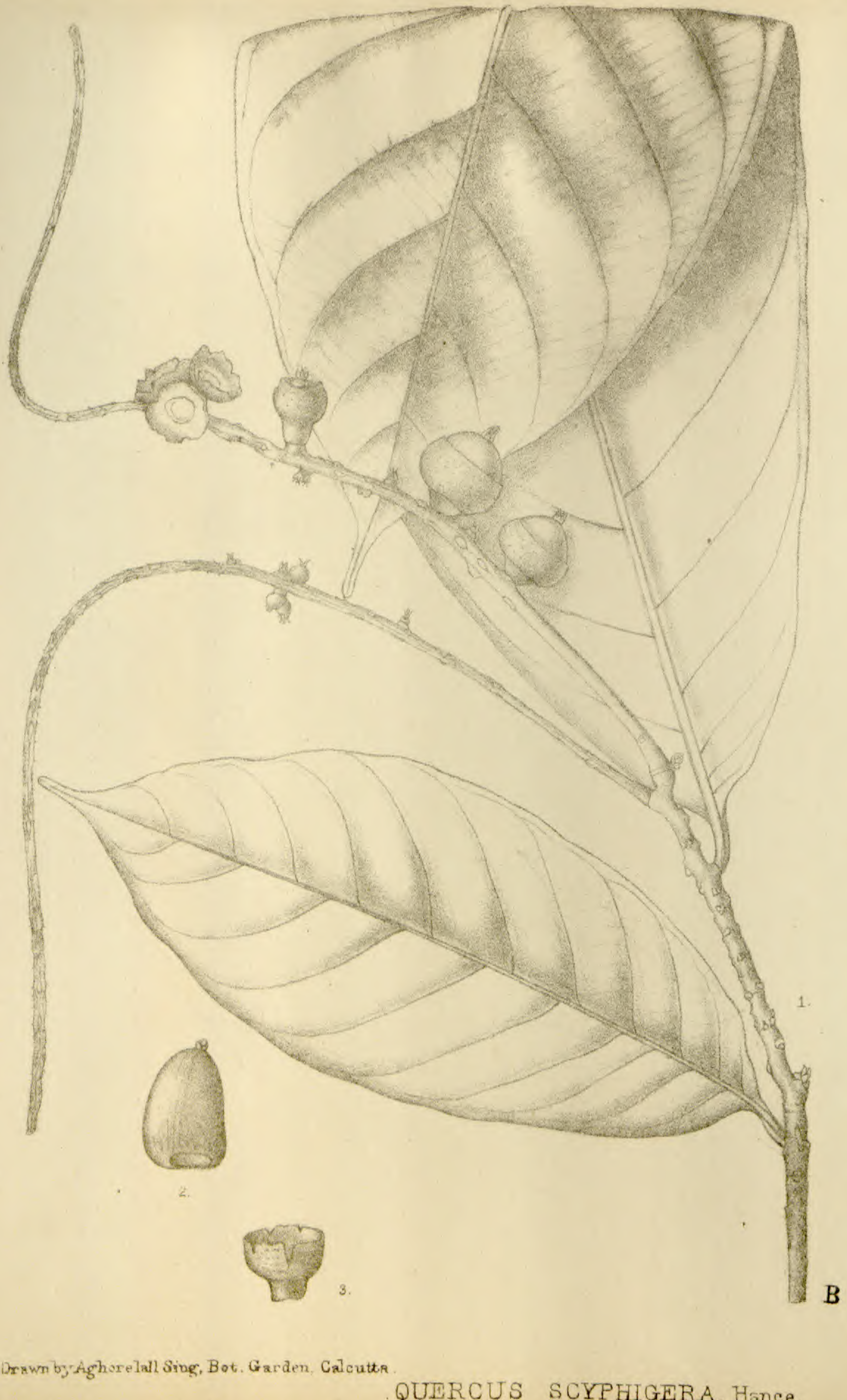
Lith: by H.C.Datta, Govt: School of Art. Calcutta.

QUERCUS LINEATA, BLUME.
6-9 VAR. THOMSONIANA. 9-12 VAR. HILLDEBRANDII.



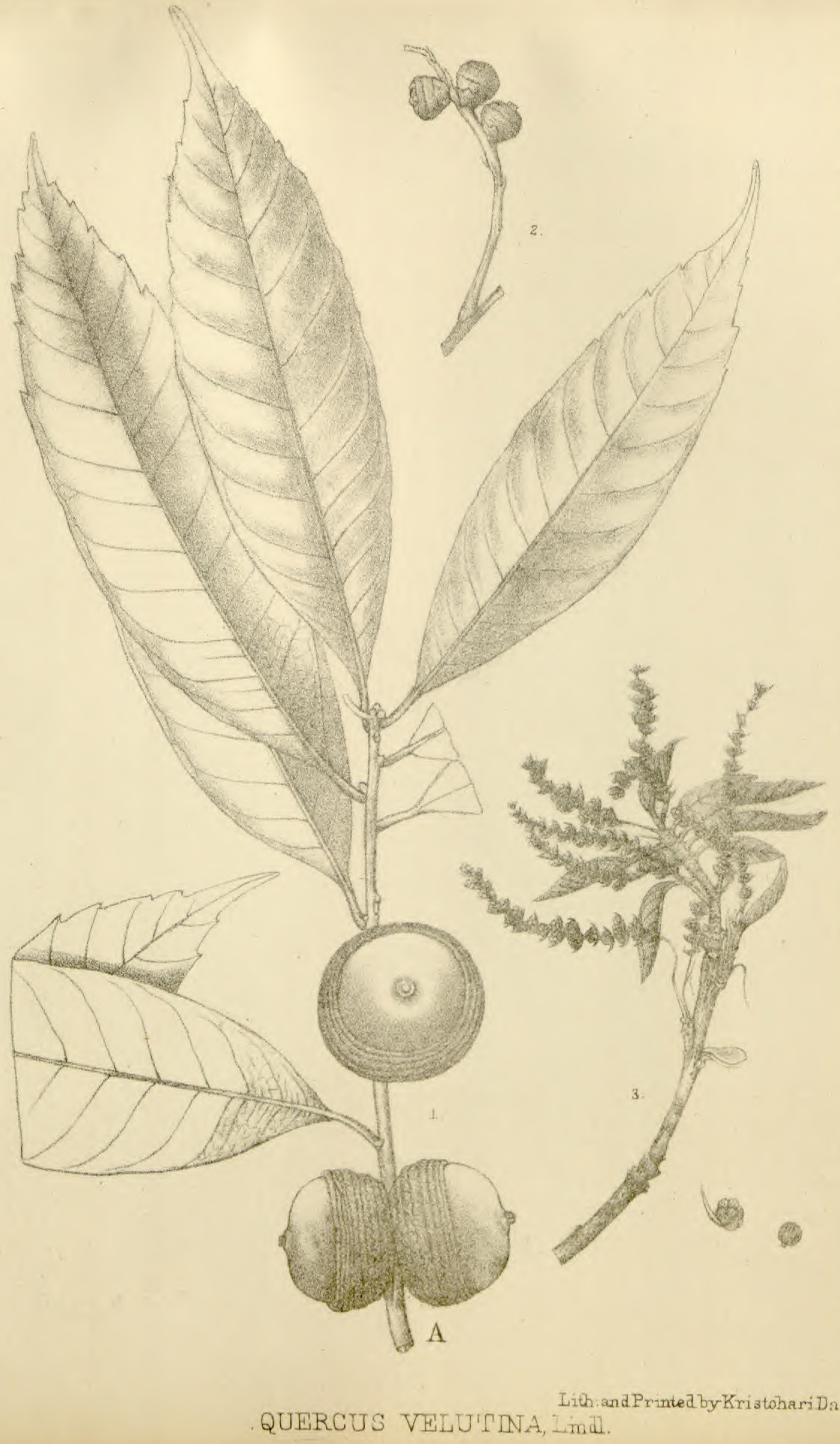
G. C. Das, del. Bot. Garden, Calcutta. Lith: by A. C. Singha, Govt. School of Art, Calcutta.

QUERCUS MESPILIFOLIA, Wall.



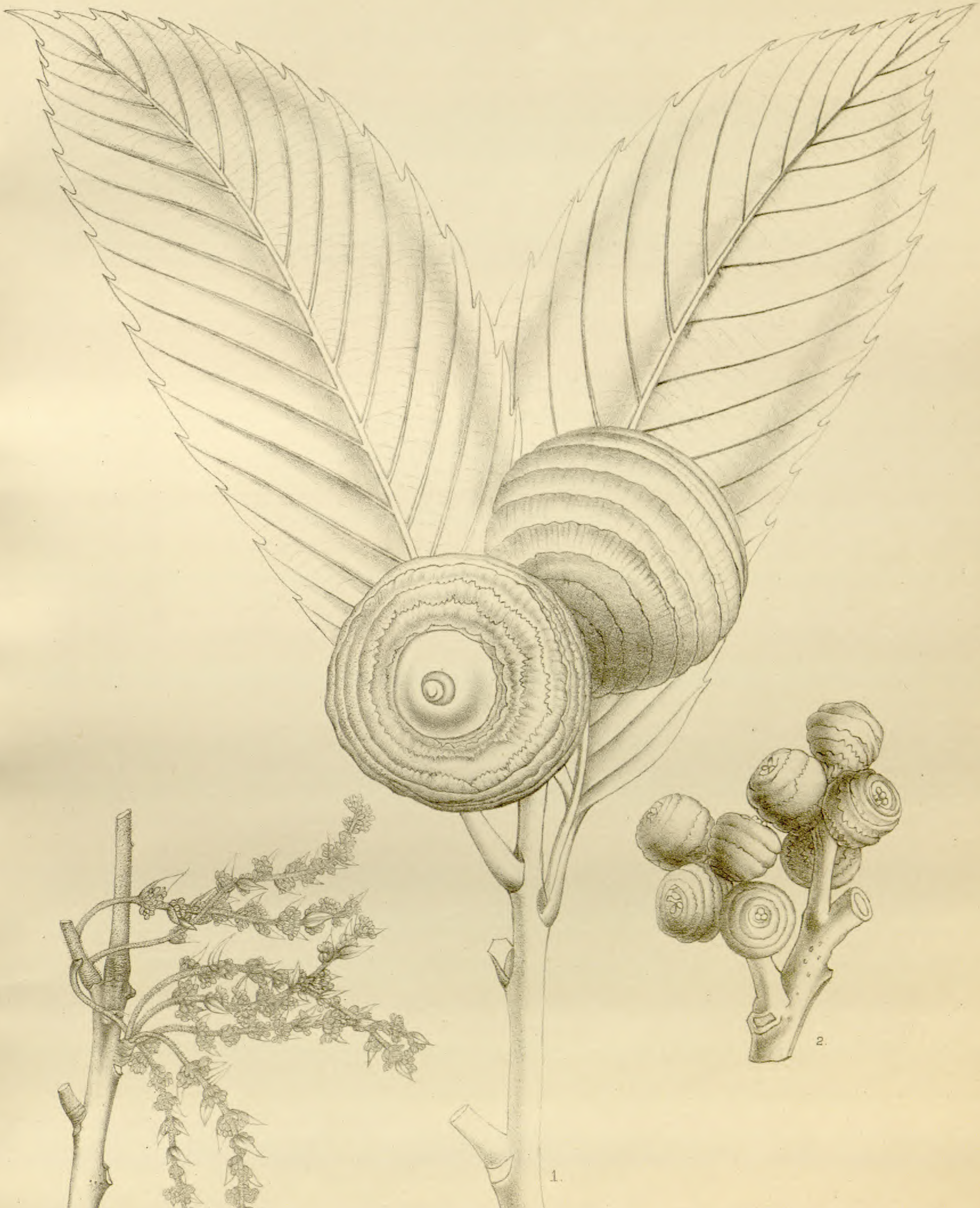
Drawn by Aghorelall Sing, Bot. Garden, Calcutta.

QUERCUS SCYPHIGERA, Hance.



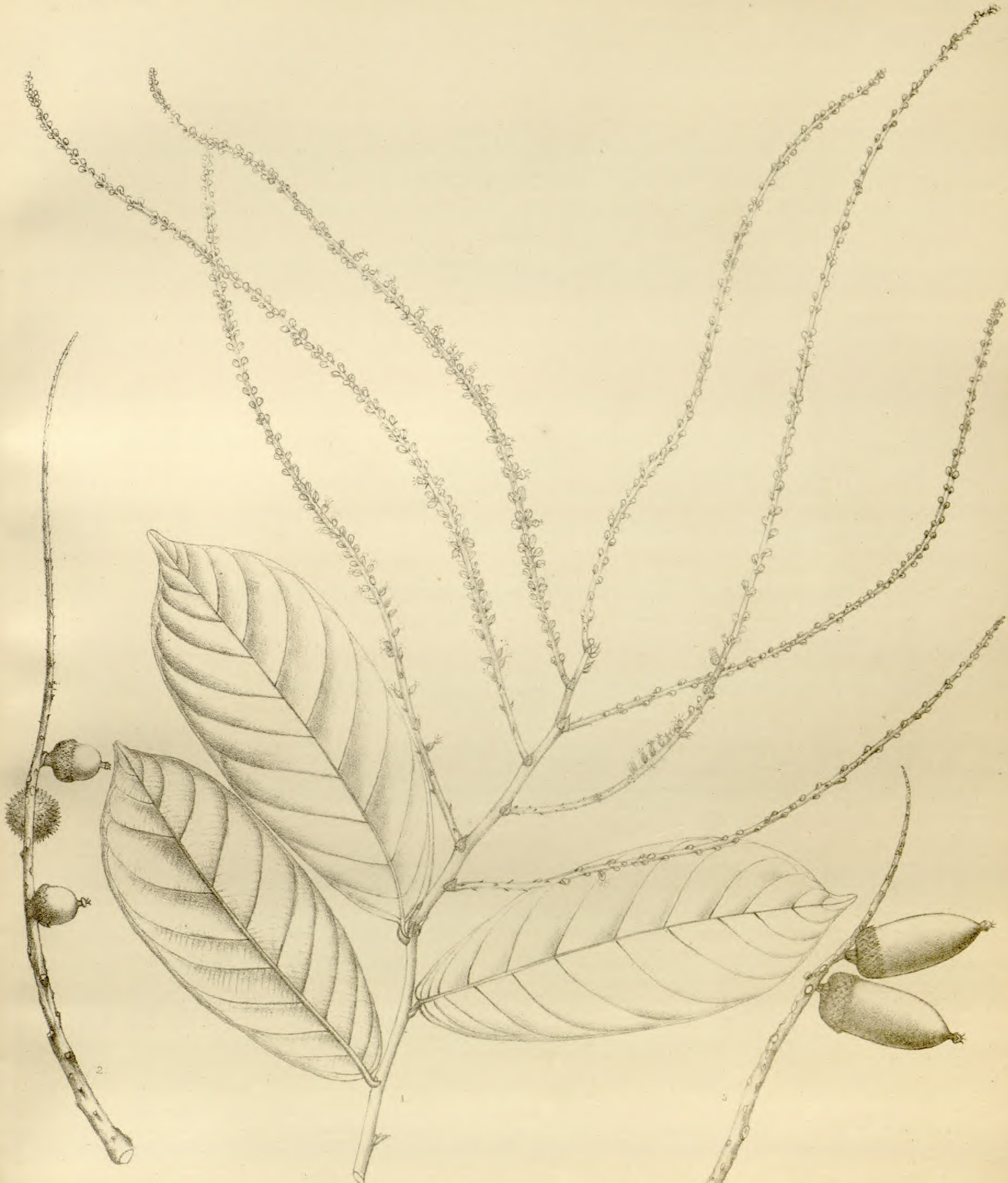
Lith. and Printed by Kristohari Das.

QUERCUS VELUTINA, Lindl.



Drawn by Gopal Chunder Doss, Bot. Garden, Calcutta.   Lith: and Printed by Kristohari Das.

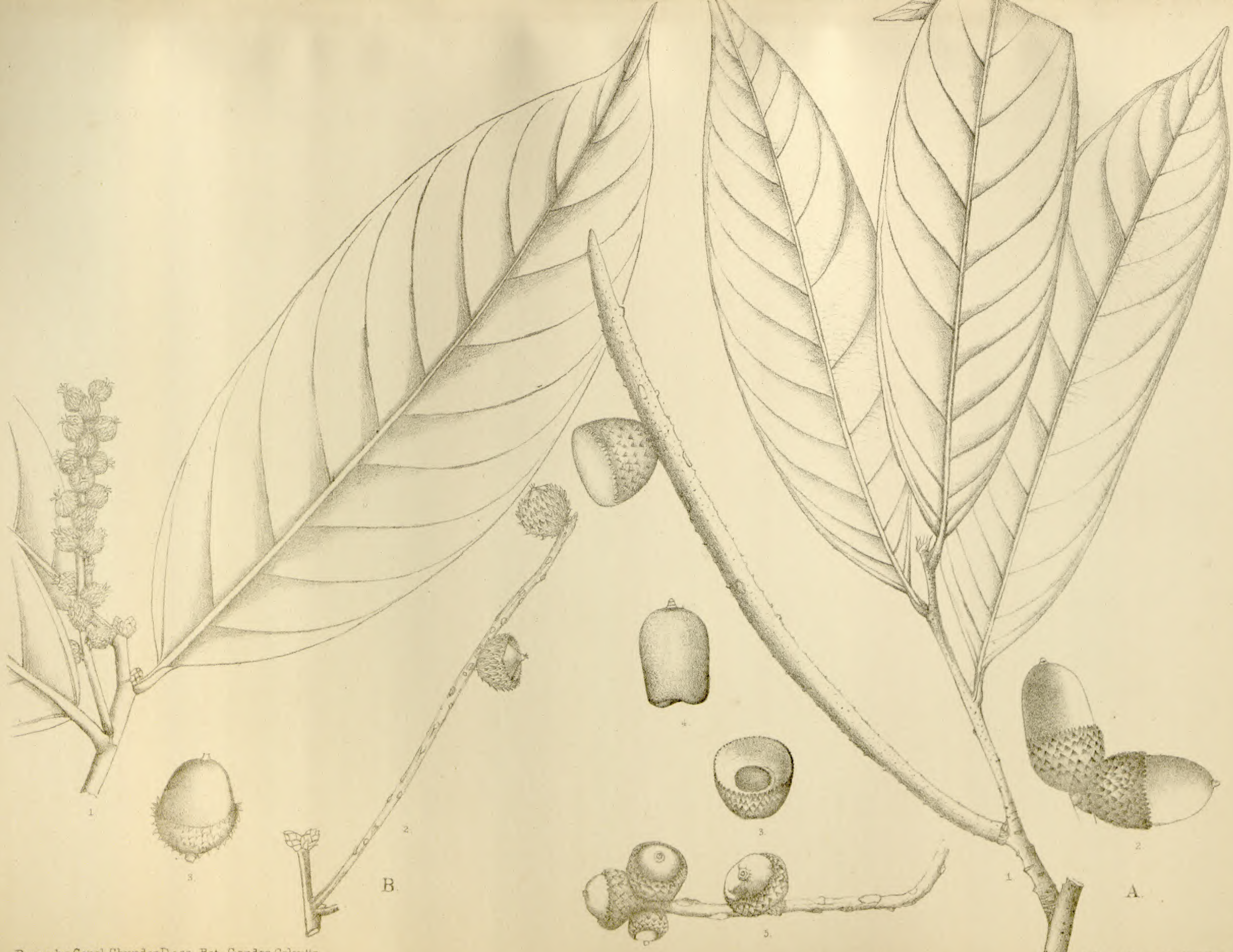
QUERCUS LAMELLOSA, Smith.



Drawn by Gopal Chunder Doss, Bot. Garden, Calcutta. Lith: and Printed by Kristohari Das.

QUERCUS KUNSTLERI, King.

PLATE 32.

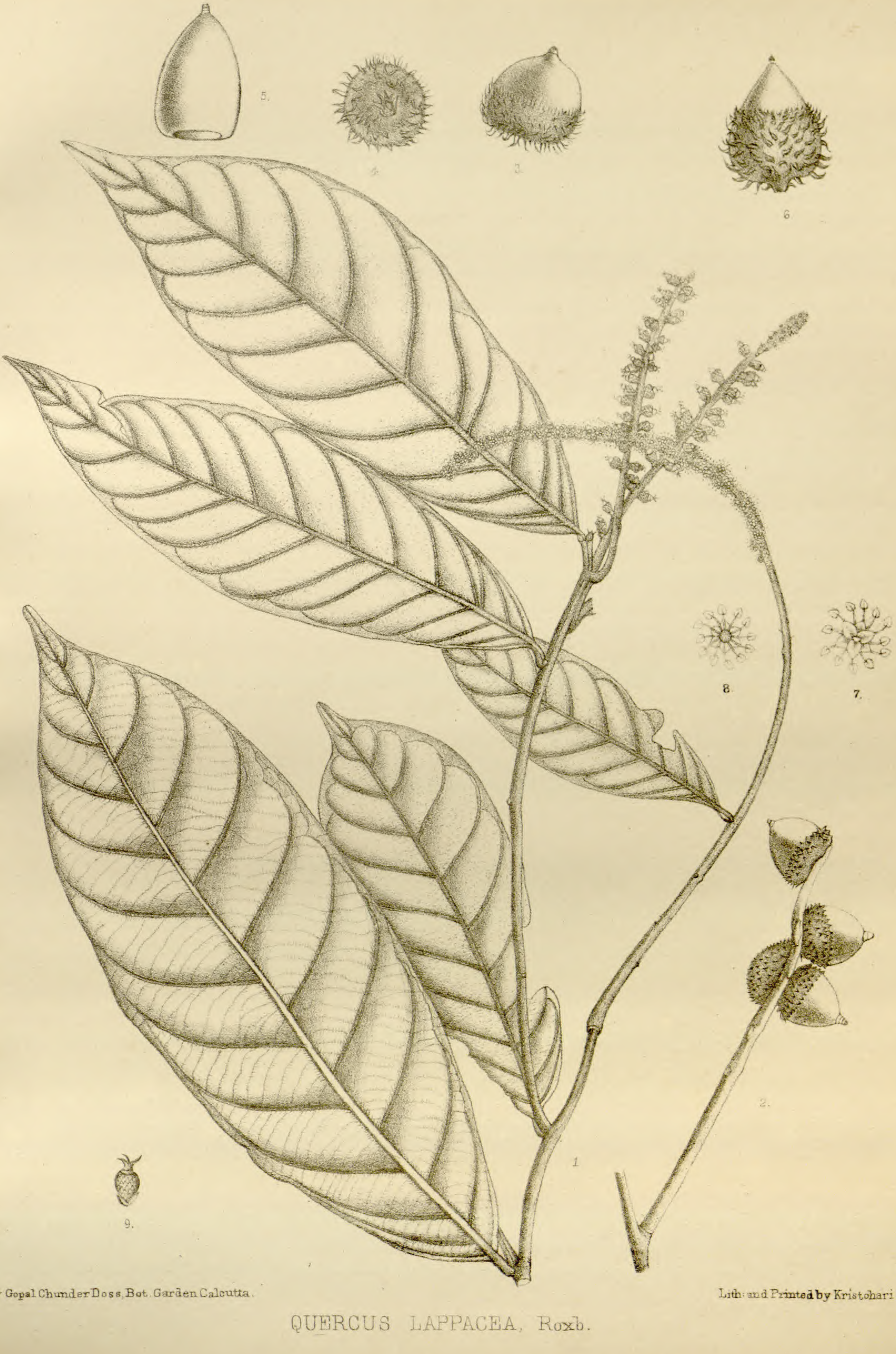


Drawn by Gopal Chunder Doss, Bot. Garden Calcutta.

Lith: and Printed by K. H. Das.

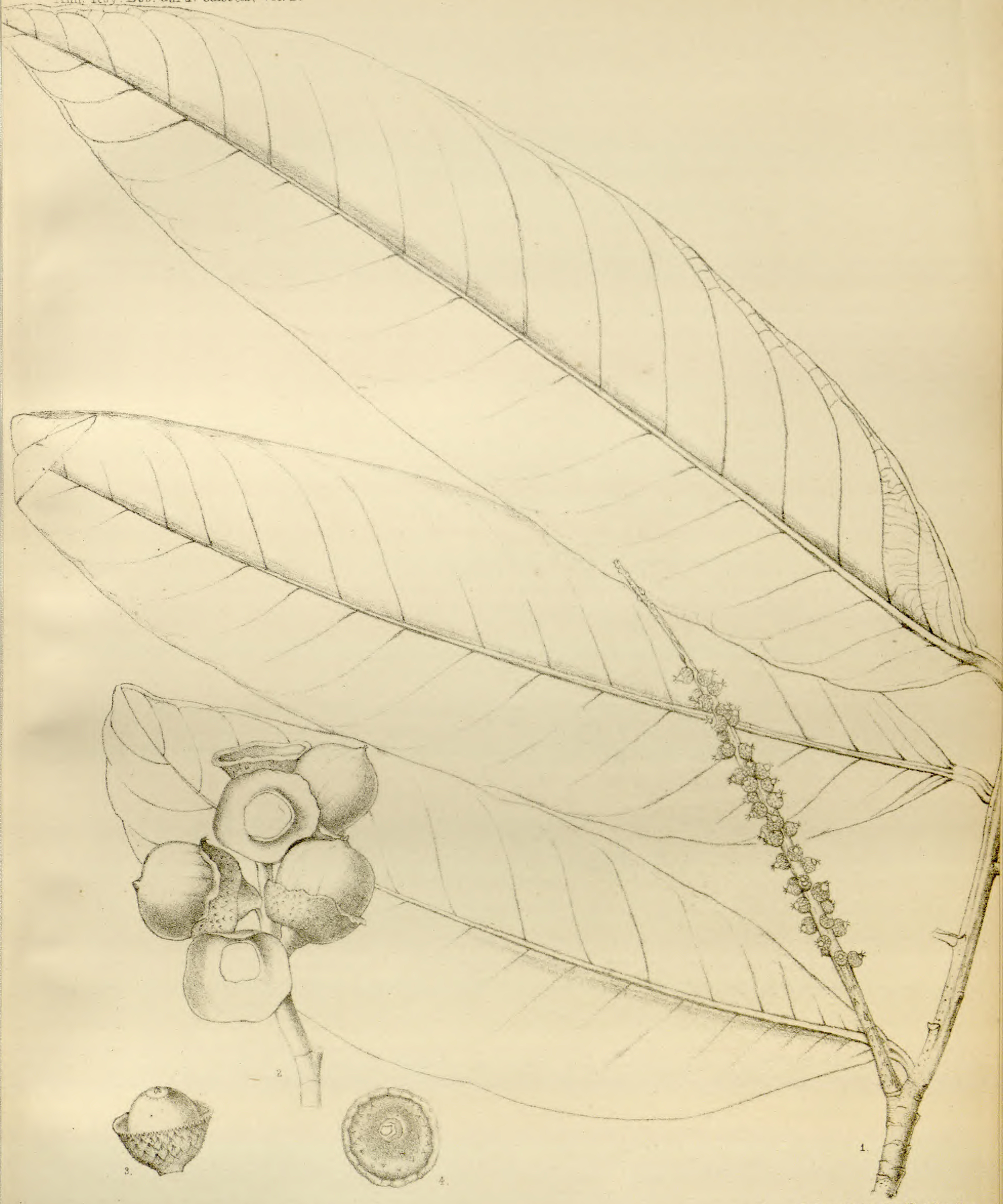
QUERCUS ACUMINATA, Roxb.

QUERCUS AMHERSTIANA, Wall.



Drawn by Gopal Chunder Doss, Bot. Garden Calcutta. Lith: and Printed by Kristohari Das.

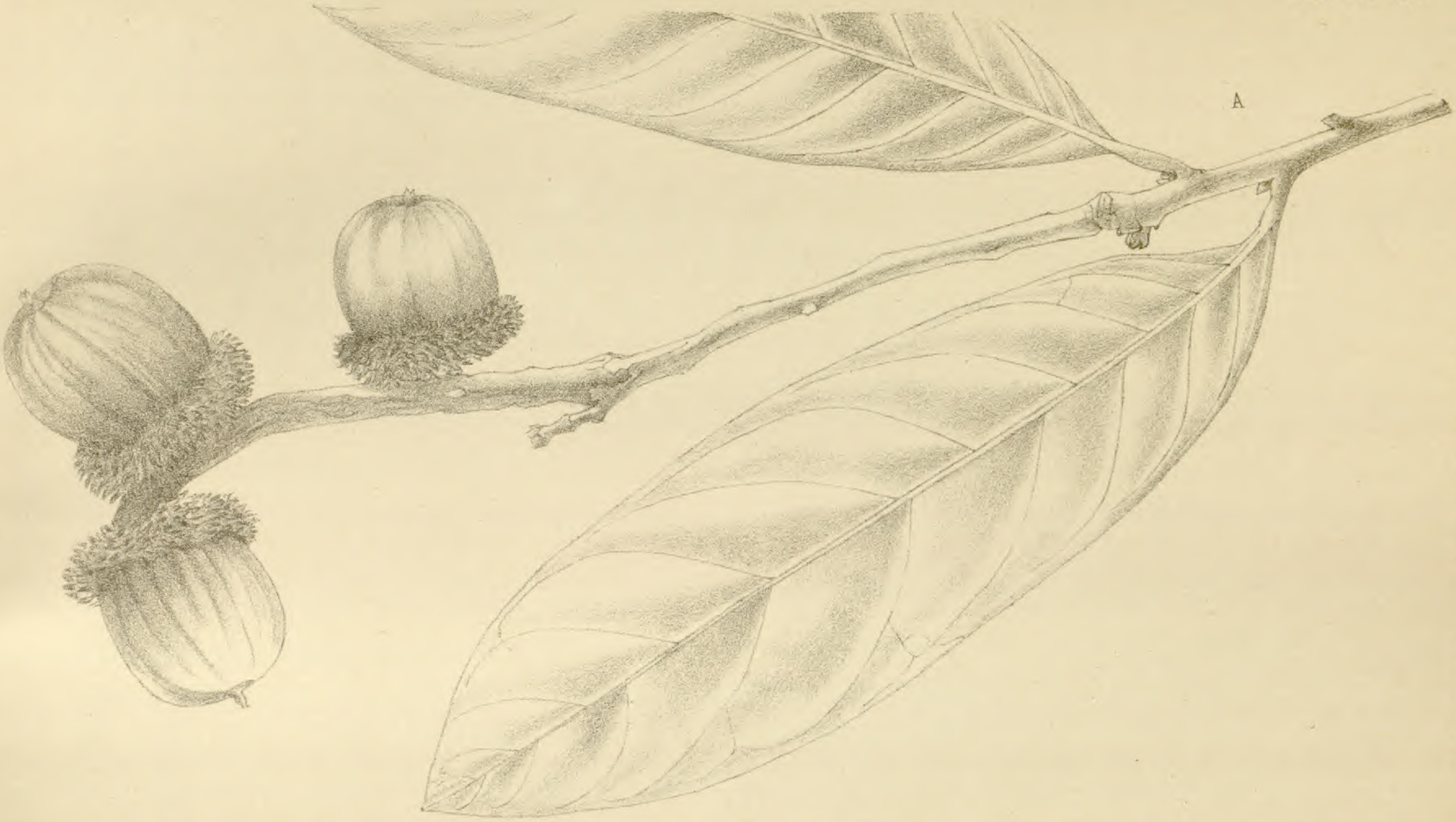
QUERCUS LAPPACEA, Roxb.



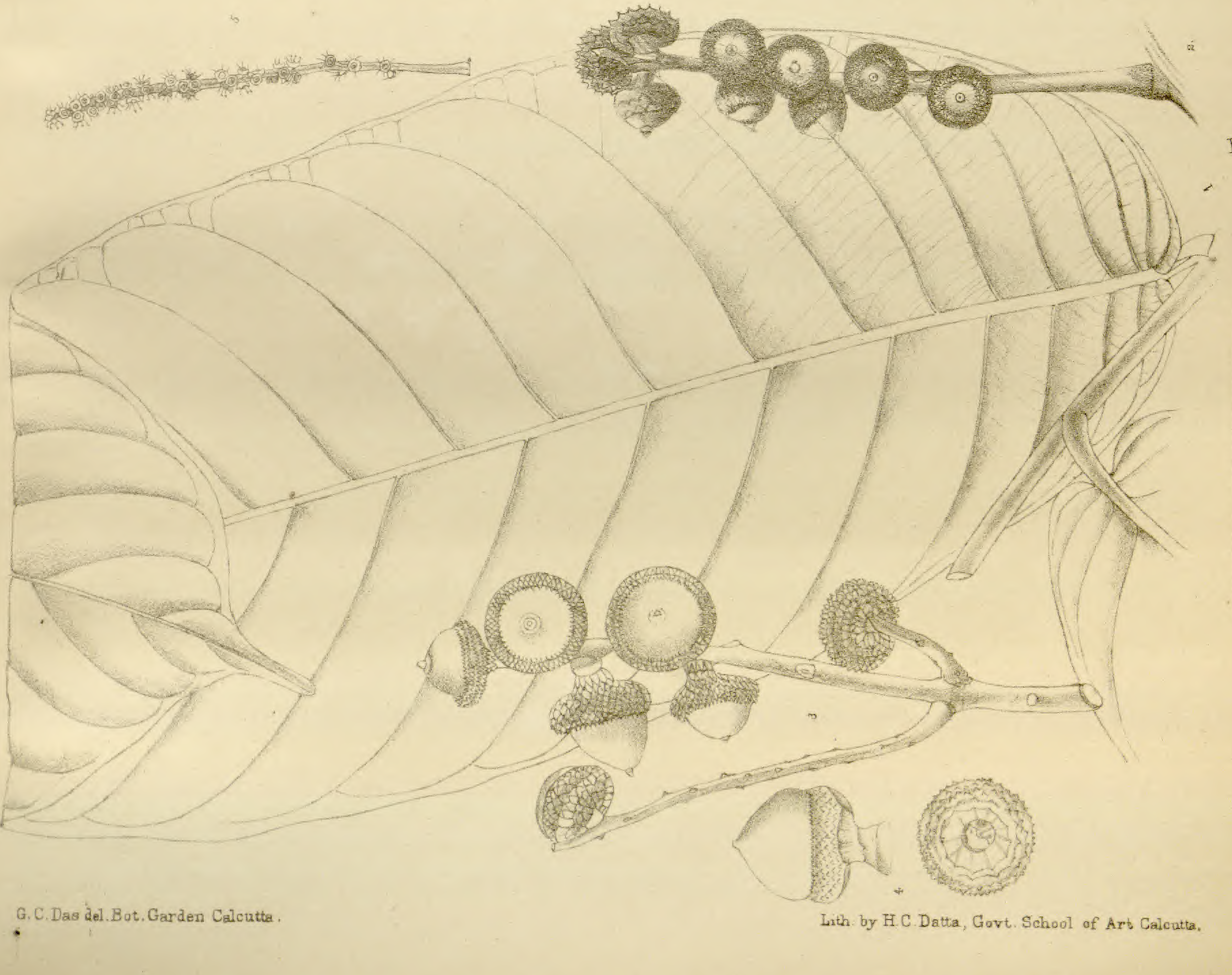
Drawn by Aghore lall singh Bot. Garden, Calcutta.

Lith. and Printed by Kristohari Das.

QUERCUS FALCONERI, Kurz.



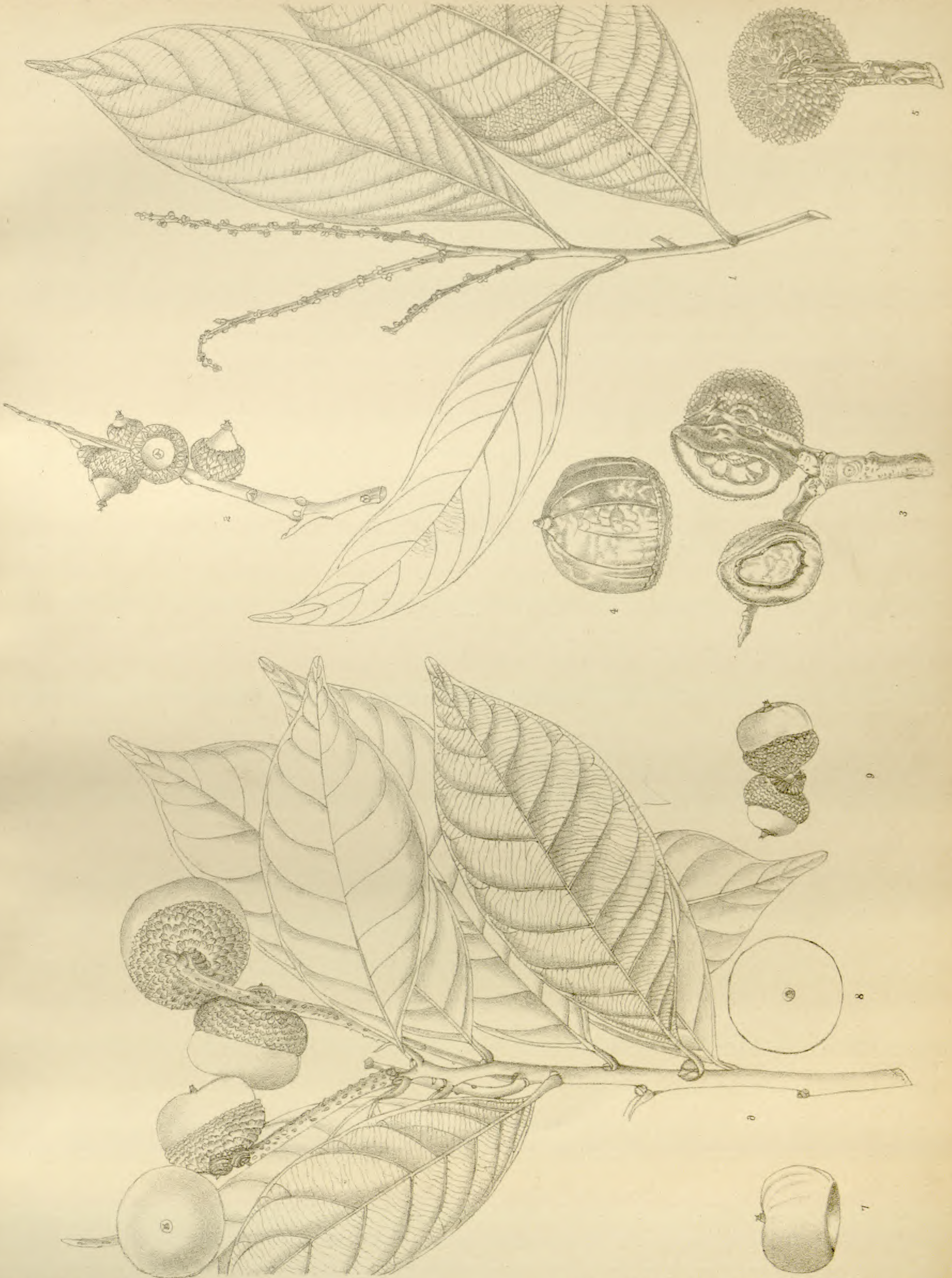
QUERCUS SCORTECHINII, King.



QUERCUS GRANDIFRONS, King.

G. C. Das del. Bot. Garden Calcutta.

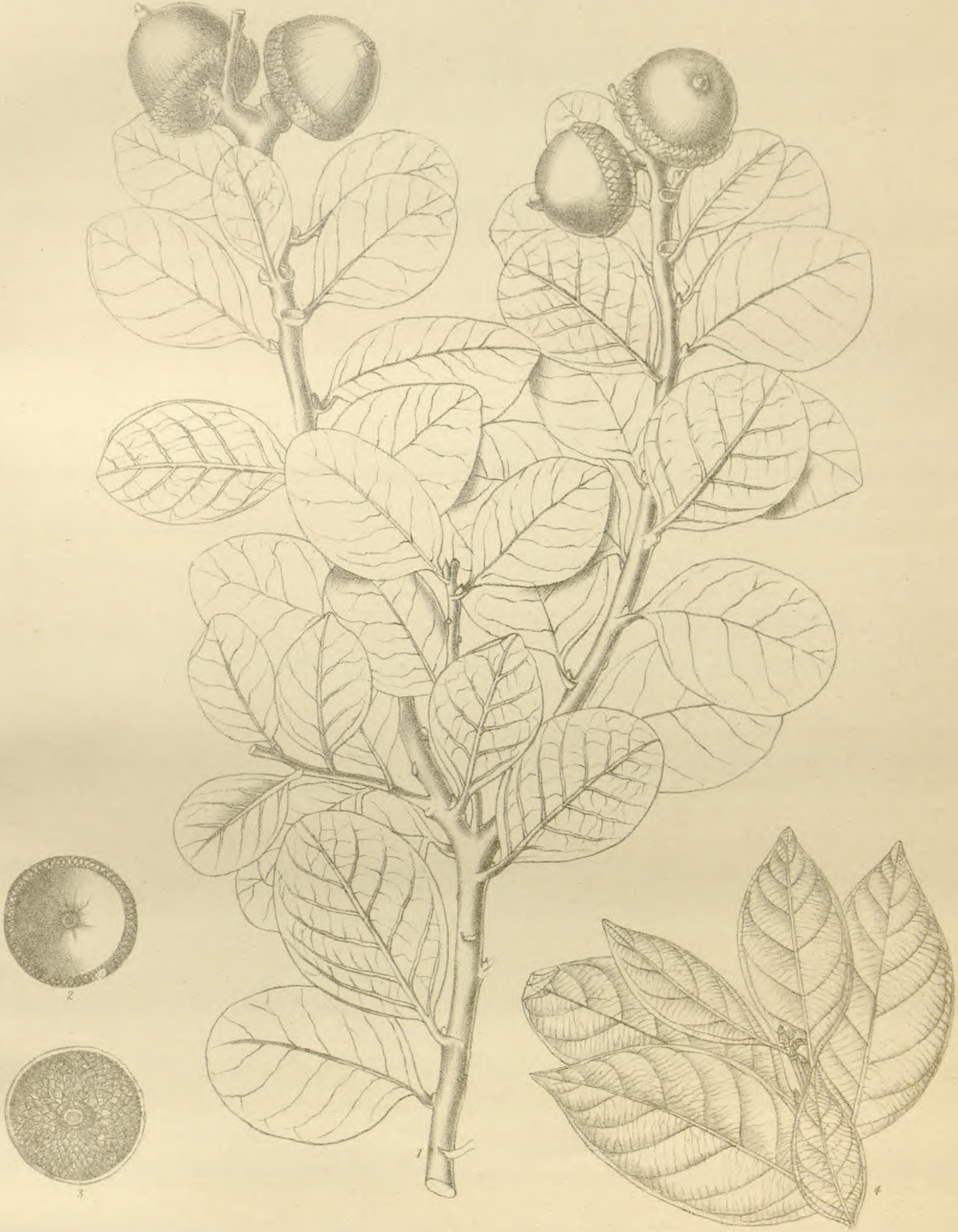
Lith. by H. C. Datta, Govt. School of Art Calcutta.



G.C.Das del. Bot. Garden Calcutta.

Lith. by H.C.Datta, Govt. School of Art, Calcutta.

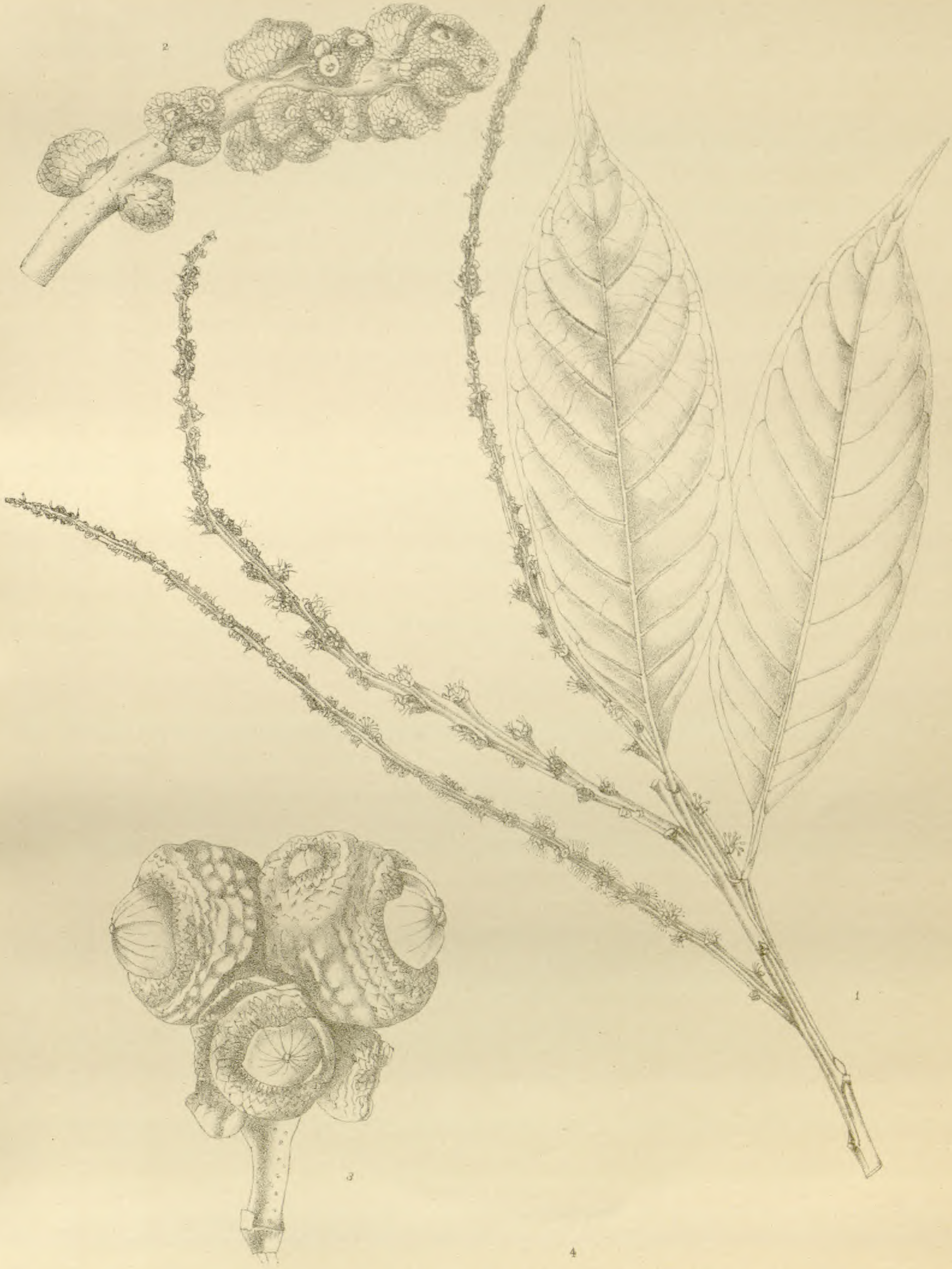
QUERCUS PSEUDO-MOLUCCA, Bl.



M. Smith del.

Lith. by A.C. Singha, Govt. School of Art, Calcutta.

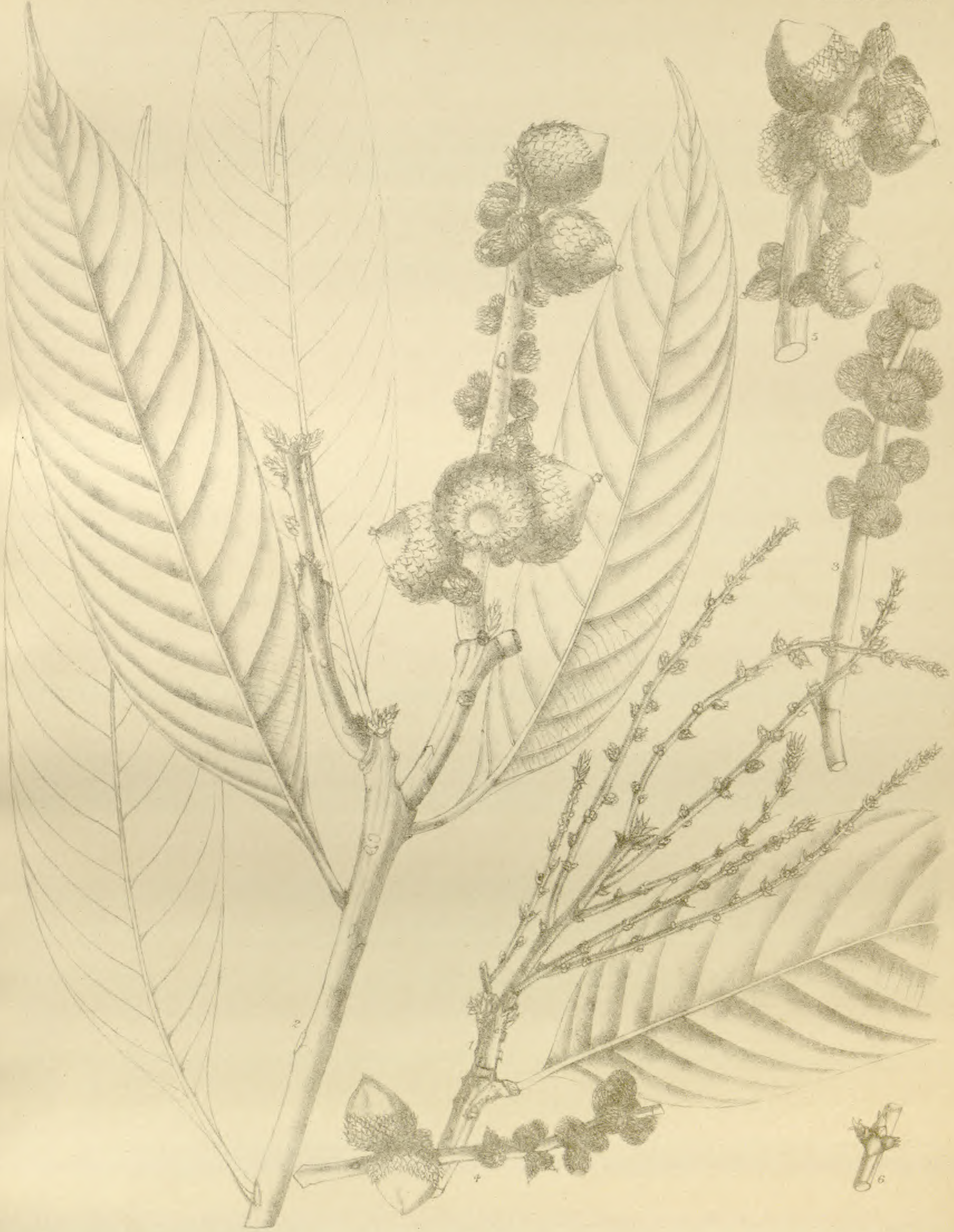
QUERCUS MONTICOLA, King.



G.C. Das del. Bot. Garden Calcutta.

Lith by H.C. Datta, Govt: School of Art, Calcutta.

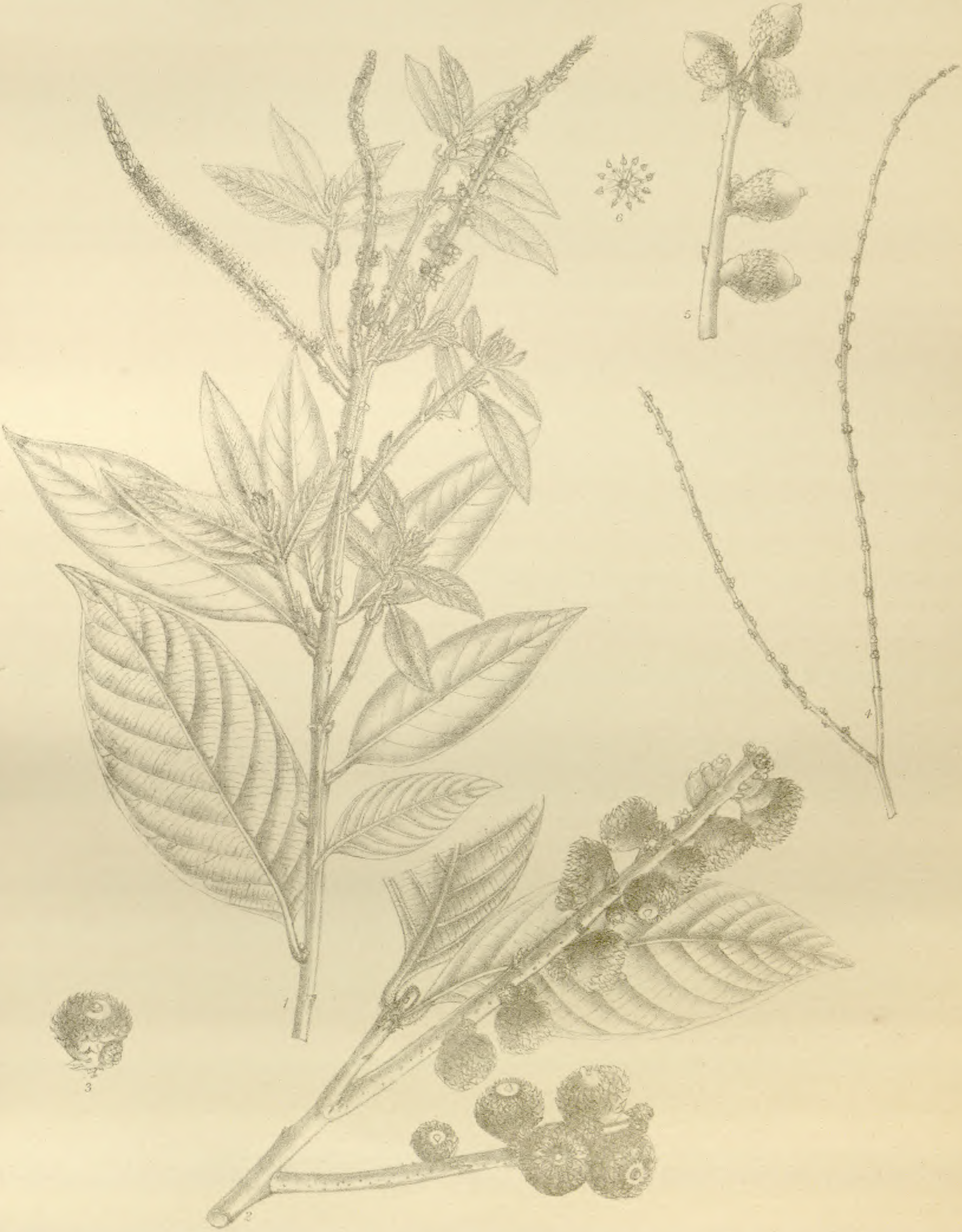
QUERCUS PACHYPHYLLA, Kurz.



G. C. Das, del Bot. Garden, Calcutta.

Lith by K. P. Das, Govt. School of Art, Calcutta.

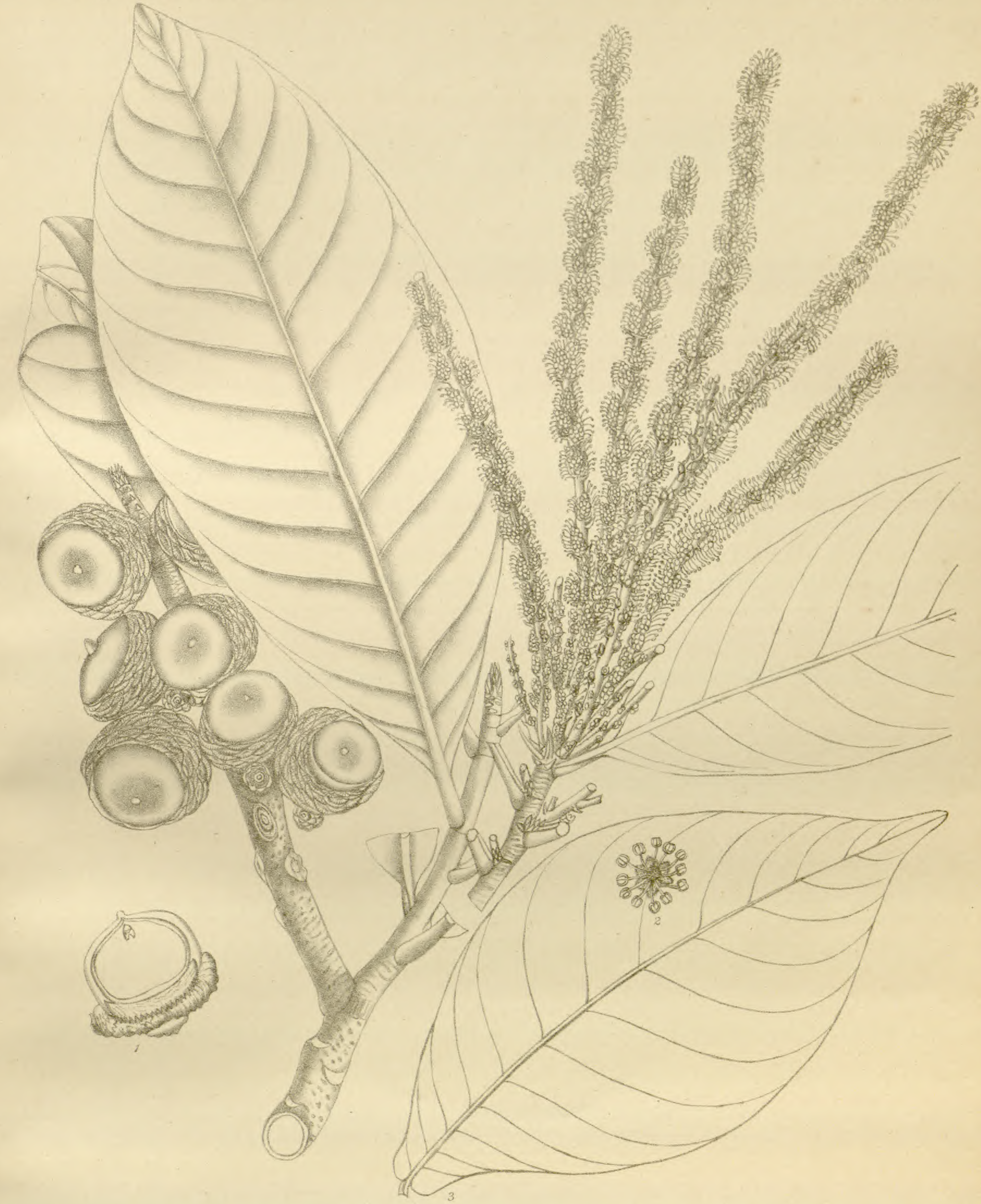
QUERCUS FENESTRATA, Roxb.



G. C. Das, del. Bot. Garden, Calcutta.

Lith. by K. P. Das, Govt. School of Art, Calcutta.

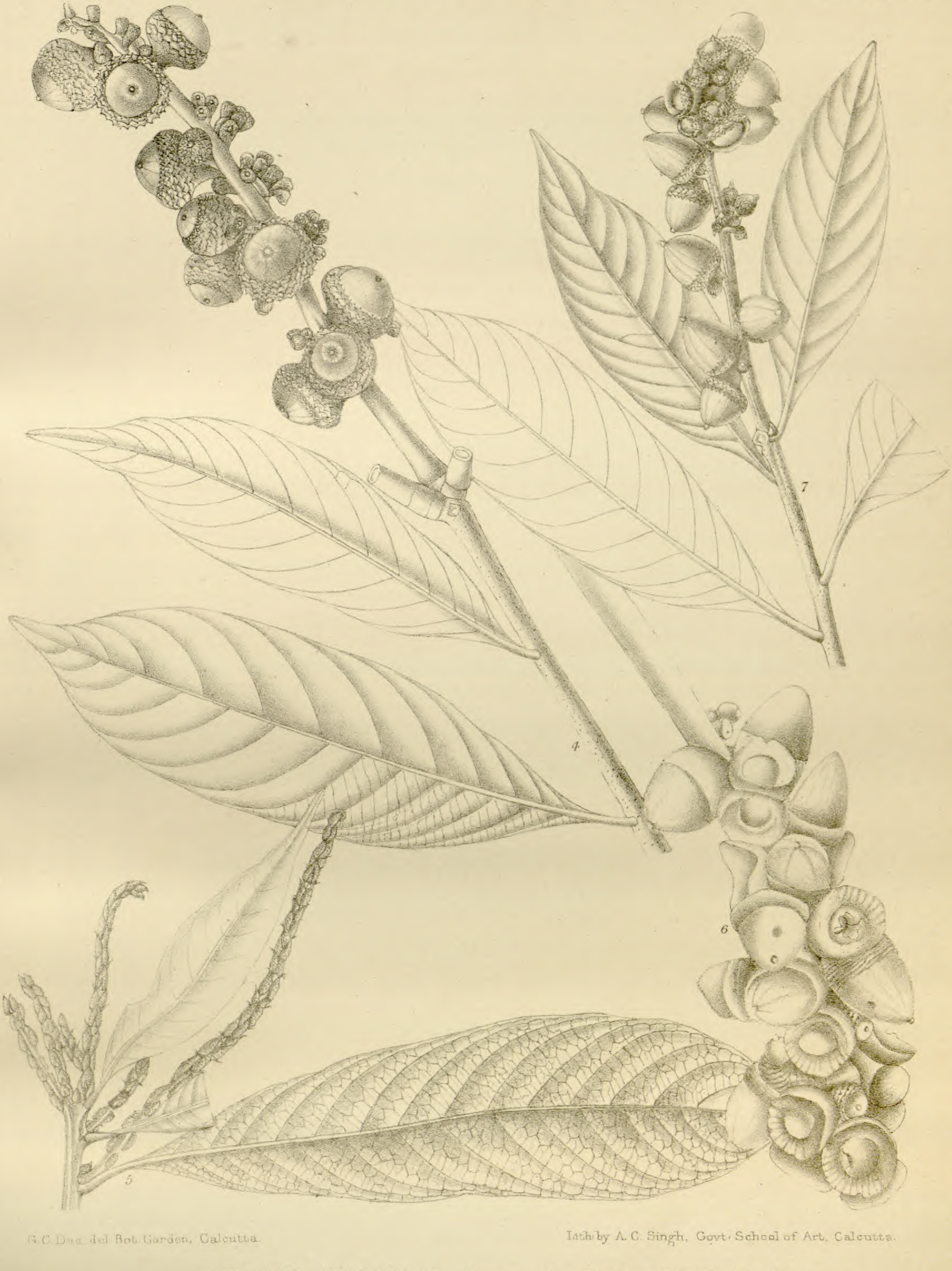
QUERCUS DEALBATA, Hook. fil. and Thoms.



G. C. Das. del. Bot. Garden Calcutta

Lith. by J.K. Bhattacharje, Govt. School of Art. Calcutta

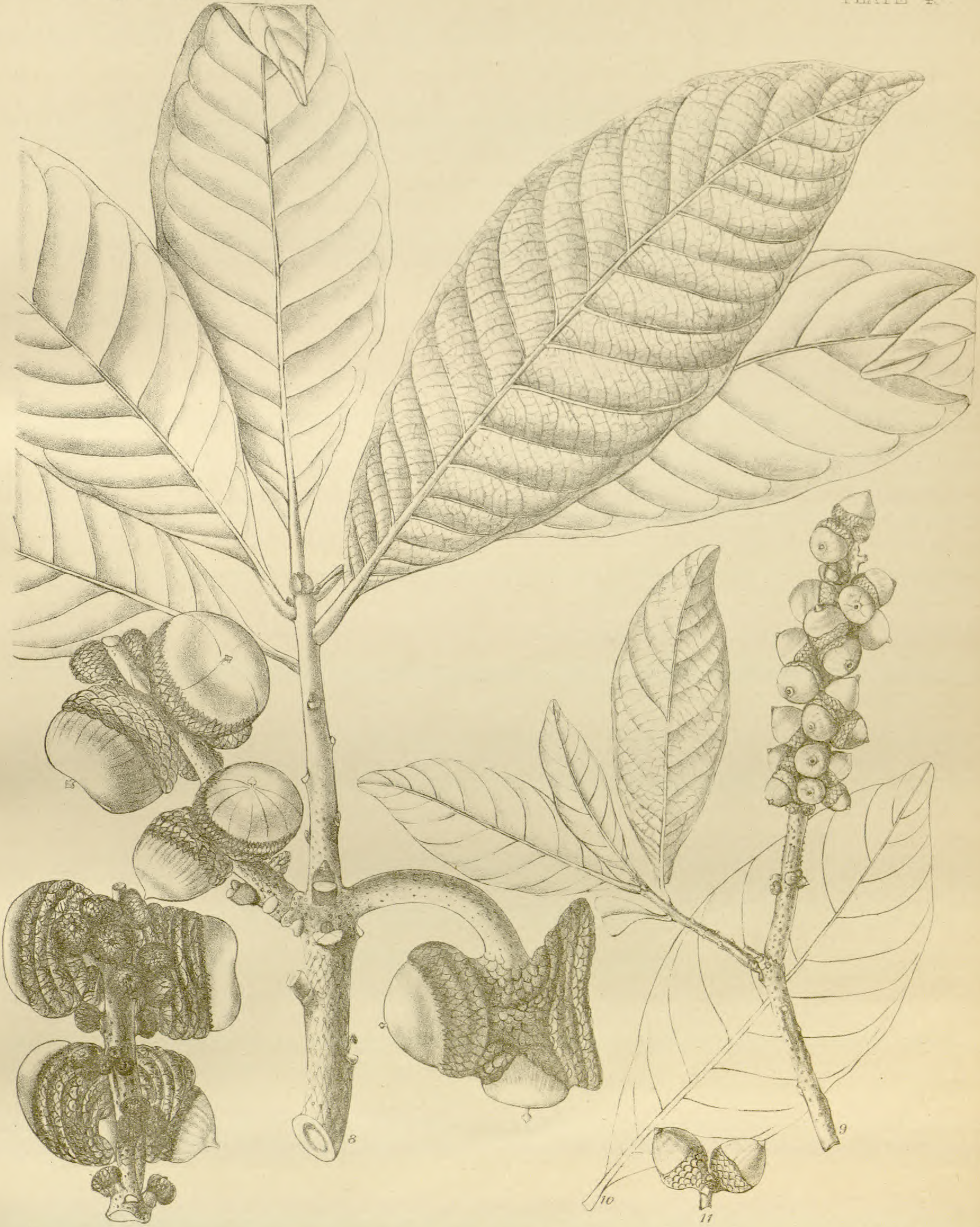
QUERCUS SPICATA, Smith



G. C. Das. del Bot. Garden, Calcutta.

Lith. by A. C. Singh, Govt. School of Art, Calcutta.

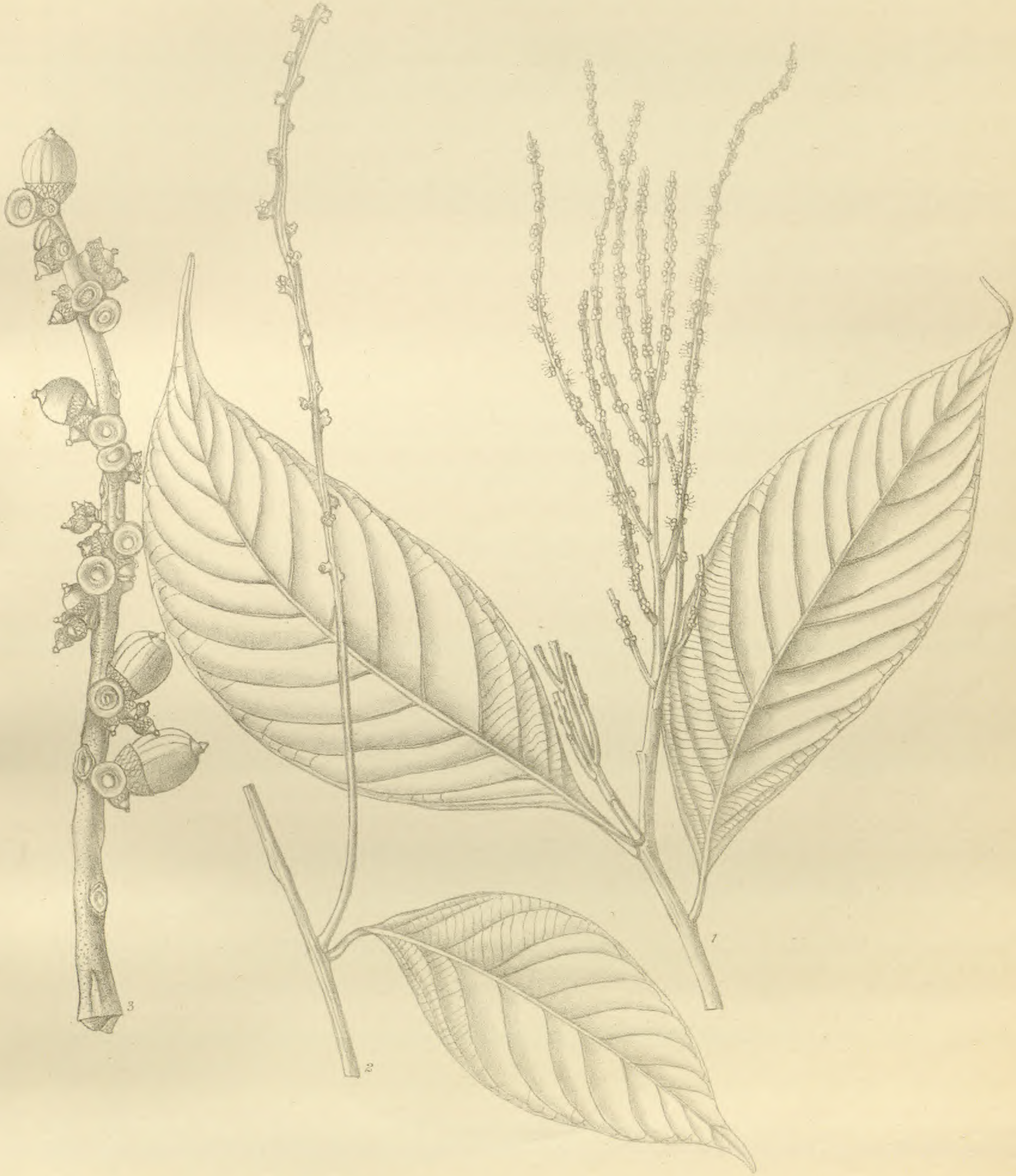
QUERCUS SPICATA, Sm. 4 var. gracilipes 5-6 var. Collettii. 7 var. Chittagonga.



G. C. Das. del. Bot. Garden, Calcutta.

Lith. by J. K. Bhattacharje, Govt. School of Art, Calcutta.

QUERCUS SPICATA, Sm. 8 Var. depressa, 9-11 Var. microcalyx.

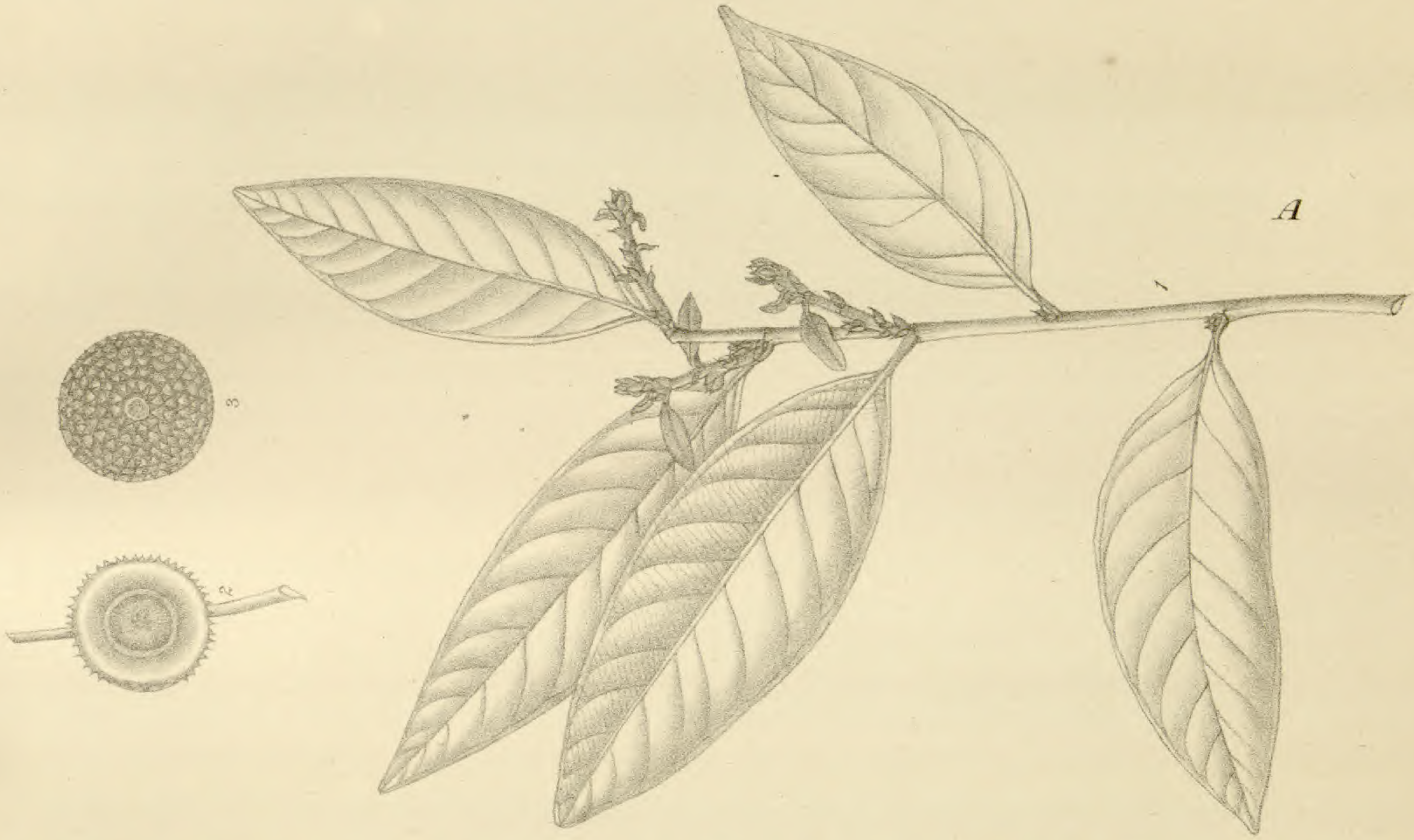


G. C. Das del. Bot. Garden Calcutta.

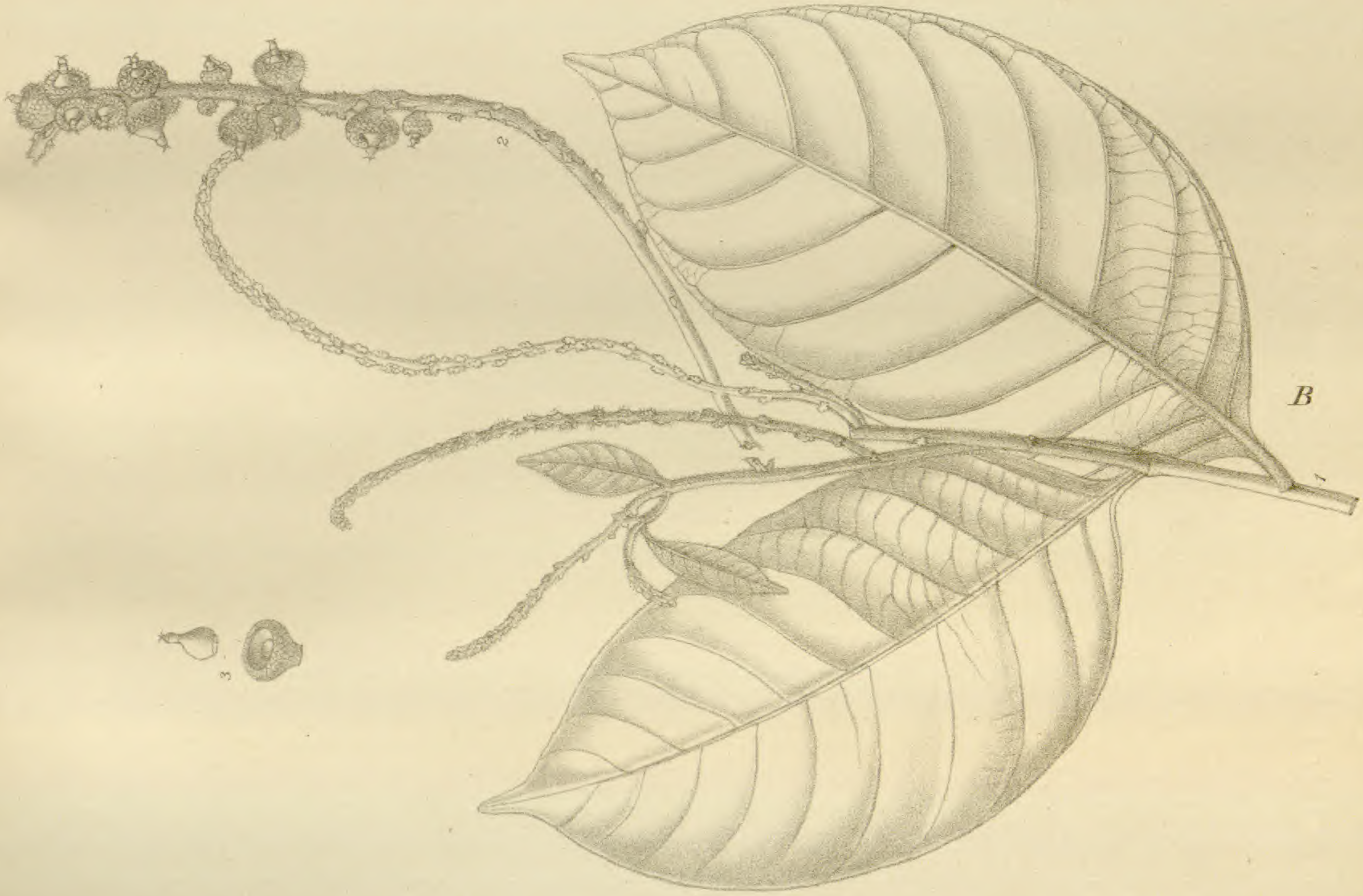
Lith. by J. K. Bhattacharjya, Govt. School of Art, Calcutta.

QUERCUS POLYSTACHYA, Wall.

PLATE 45.



QUERCUS CELEBICA, Miq.



QUERCUS DASYSTACHYA, Miq.

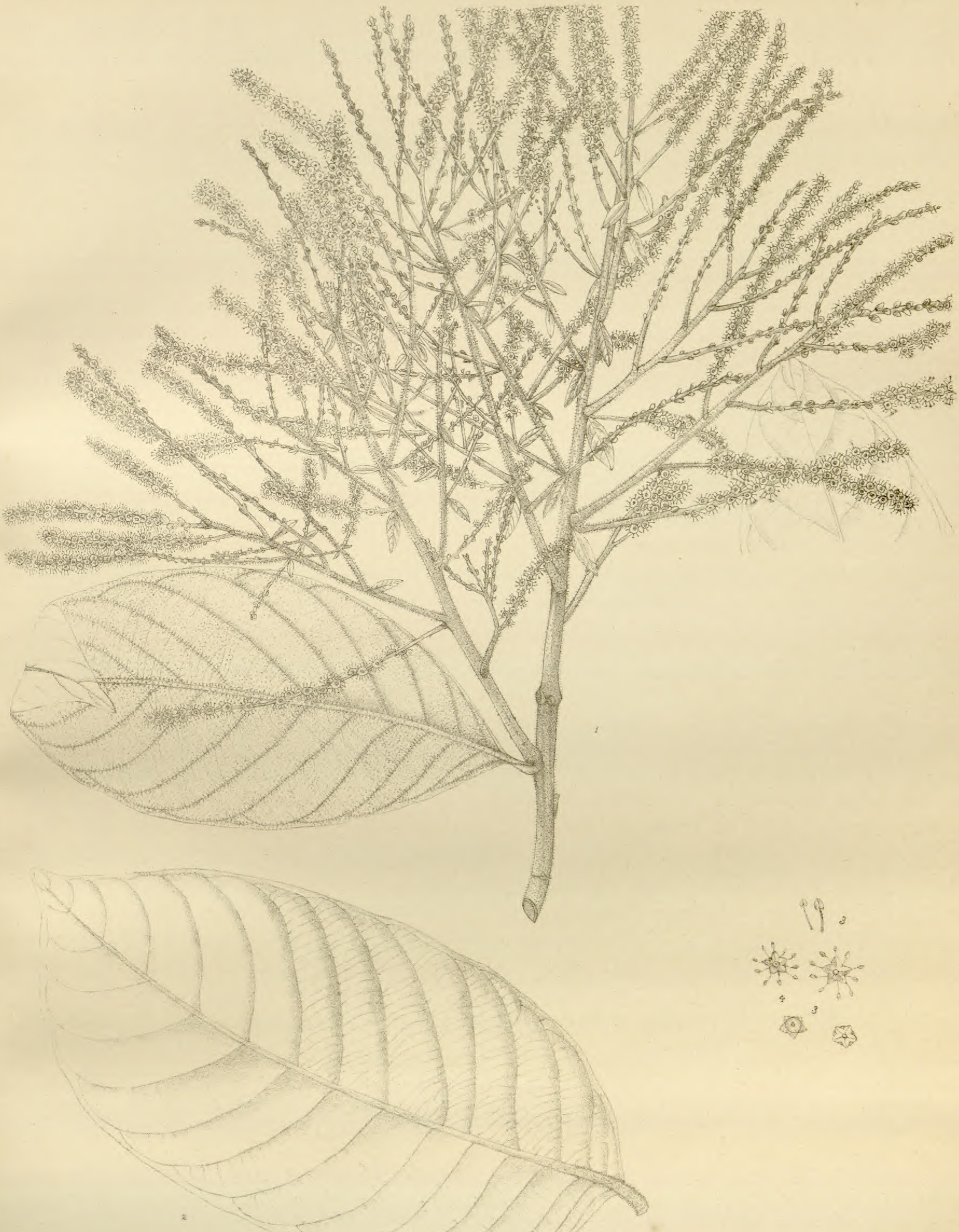
G. C. Das del. Bot. Garden. Calcutta.

Lith: by A. C. Singha, Govt. School of Art, Calcutta.

PLATE 46.

G. C. Das del. Bot. Garden Calcutta.
Lith. by J. C. Chuckerbutty Govt. School of Art, Calcutta.

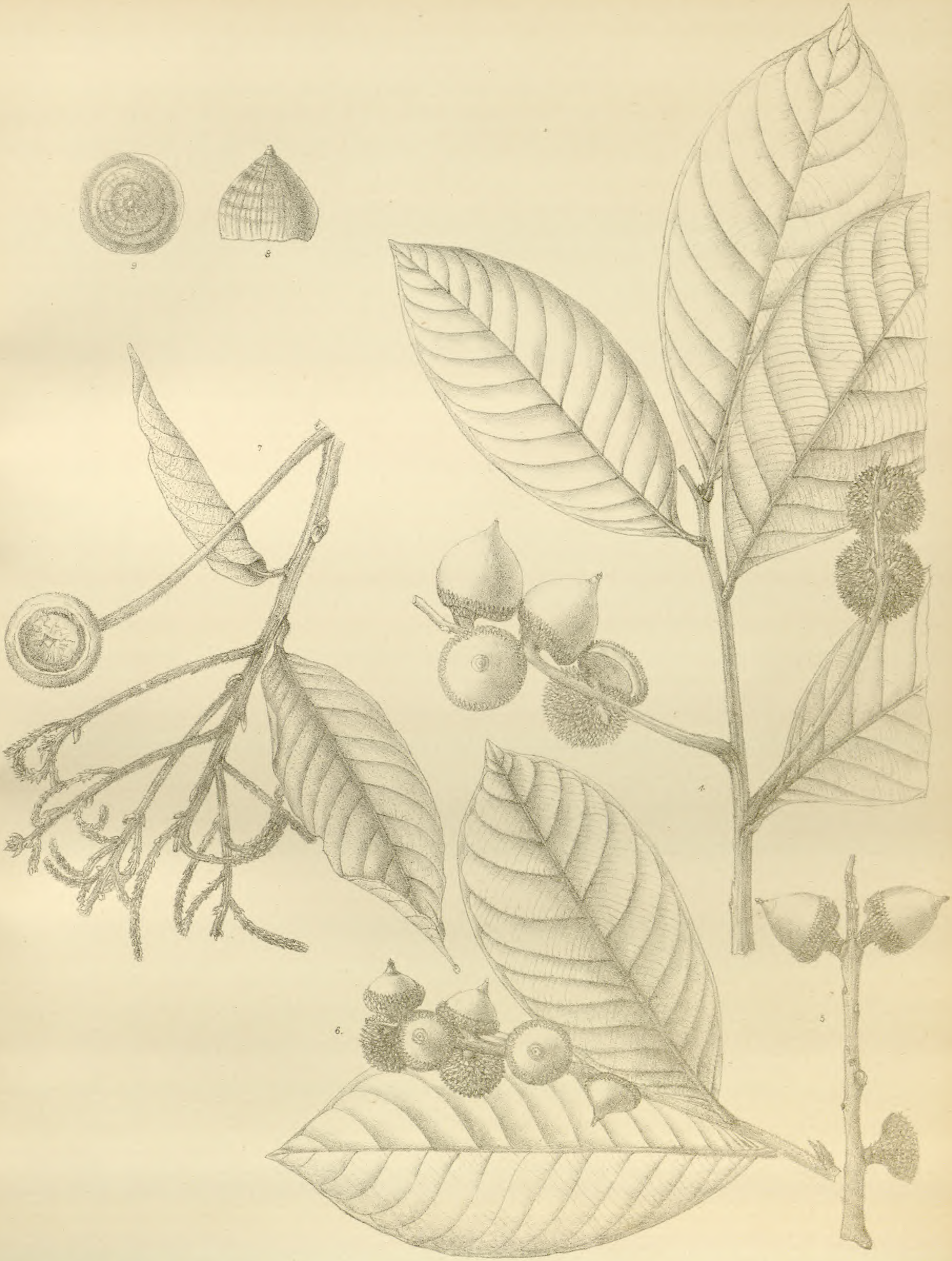
QUERCUS WALLICHIANA. Lindl.



G. C. Das del. Bot. Garden Calcutta.

Lith. by H. C. Datta, Govt. School of Art Calcutta.

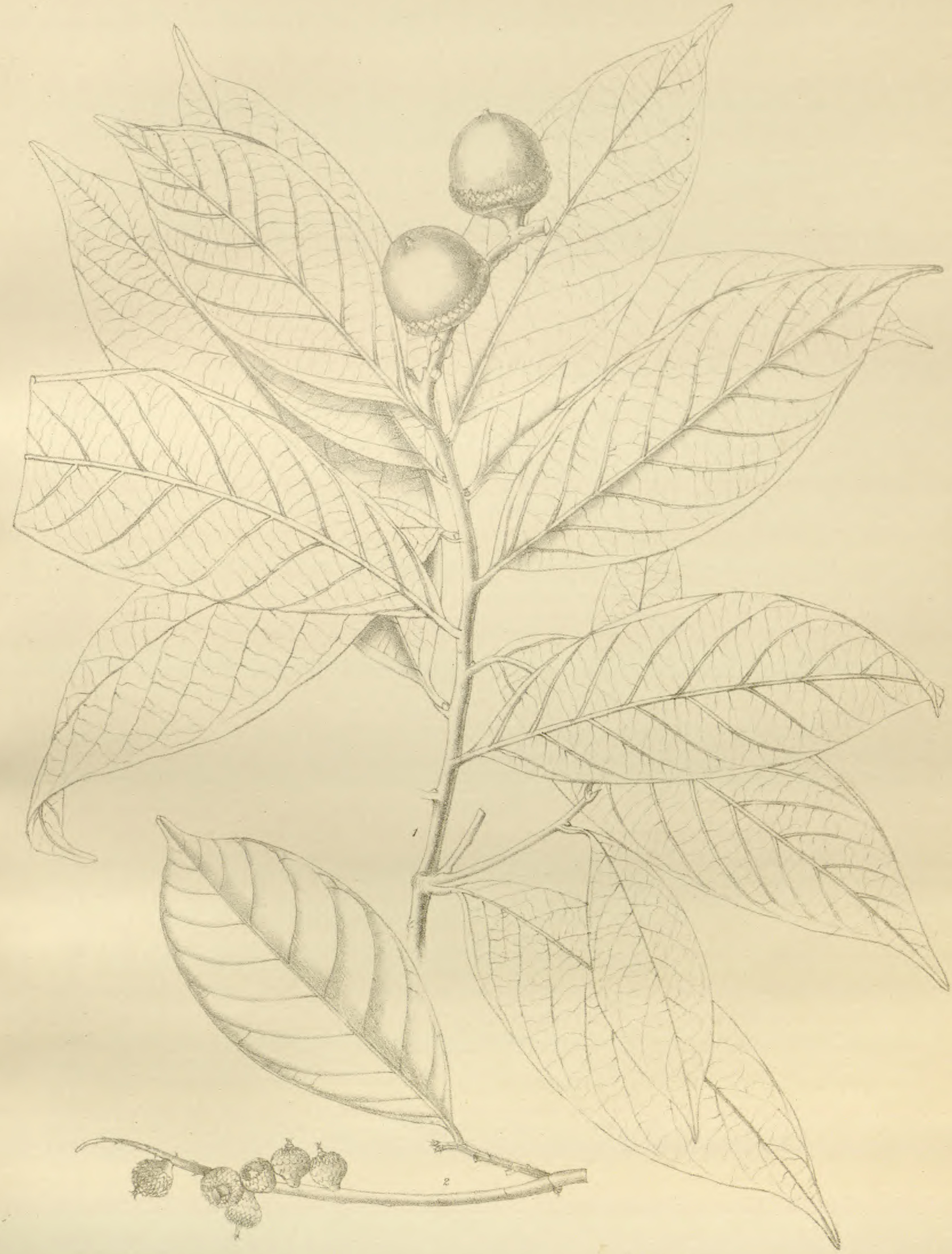
QUERCUS SUNDAICA, Bl.



G. C. Das del. Bot. Garden Calcutta.

Lith. by C. L. Dās Calcutta.

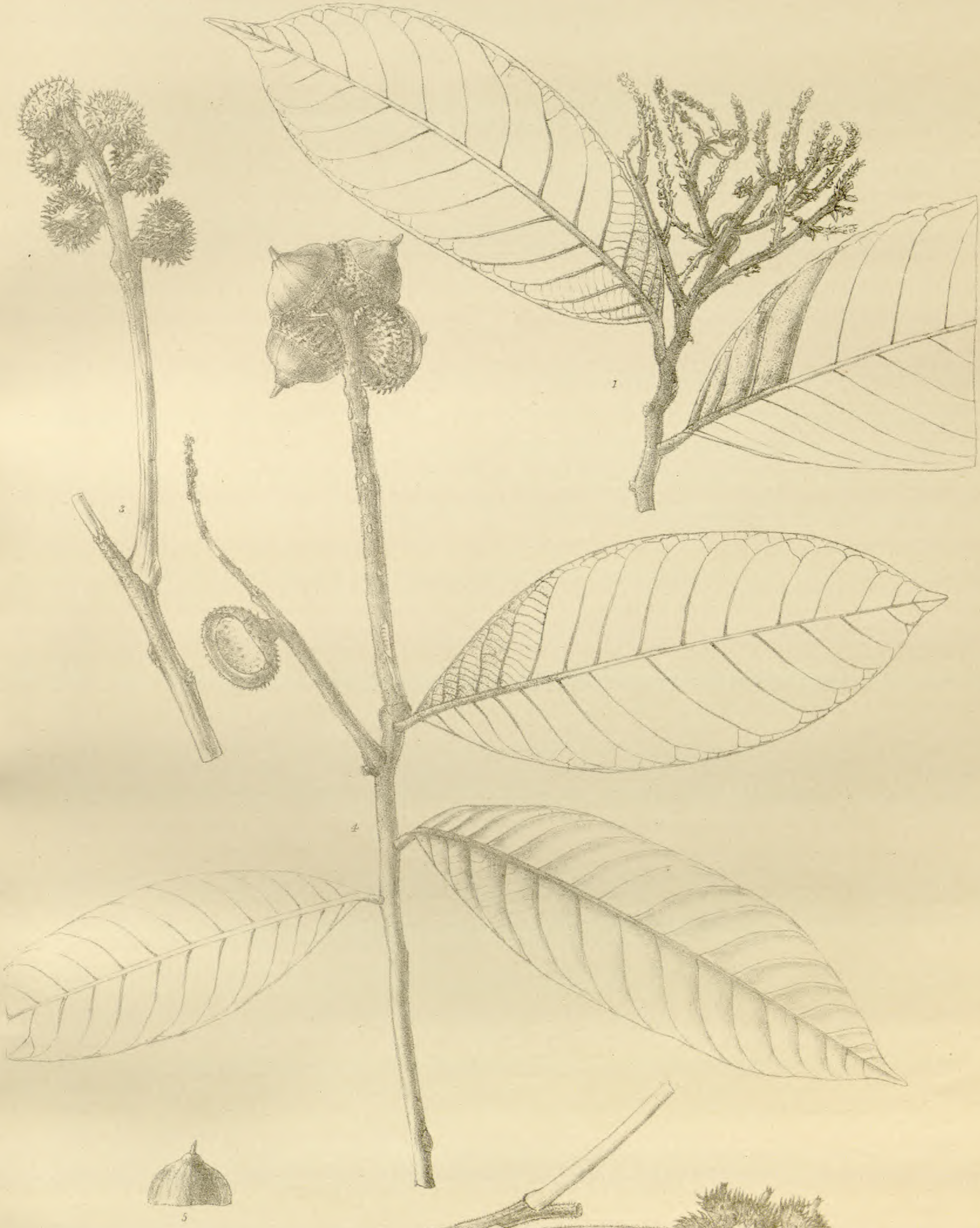
QUERCUS SUNDIACA, Blume.



M. Smith. del.

Lith. by A. C. Singha, Govt. School of Art, Calcutta.

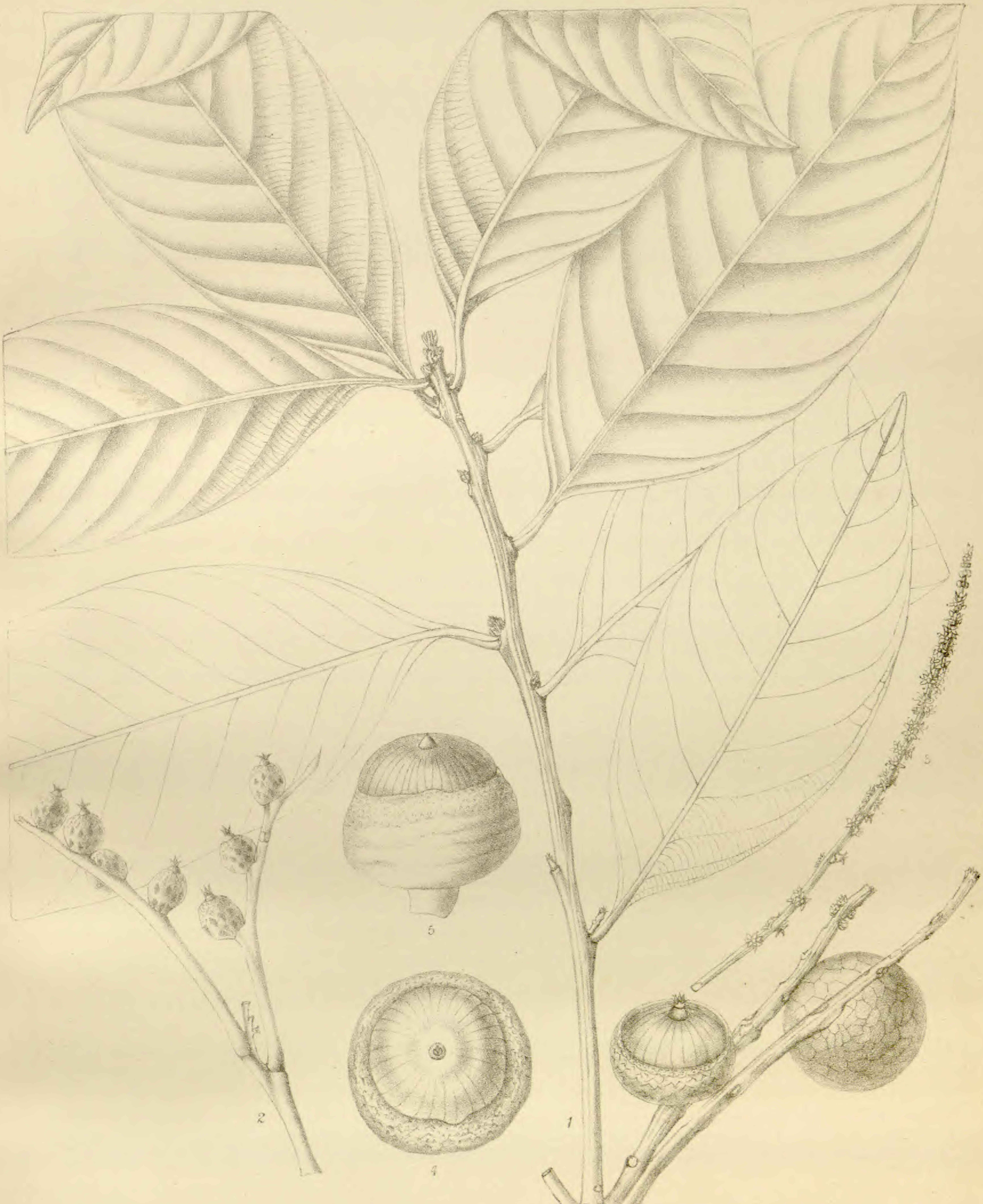
QUERCUS LAMPONGA, Miq.



G. C. Das del. Bot. Garden Calcutta.

Lith. by C. L. Das Calcutta.

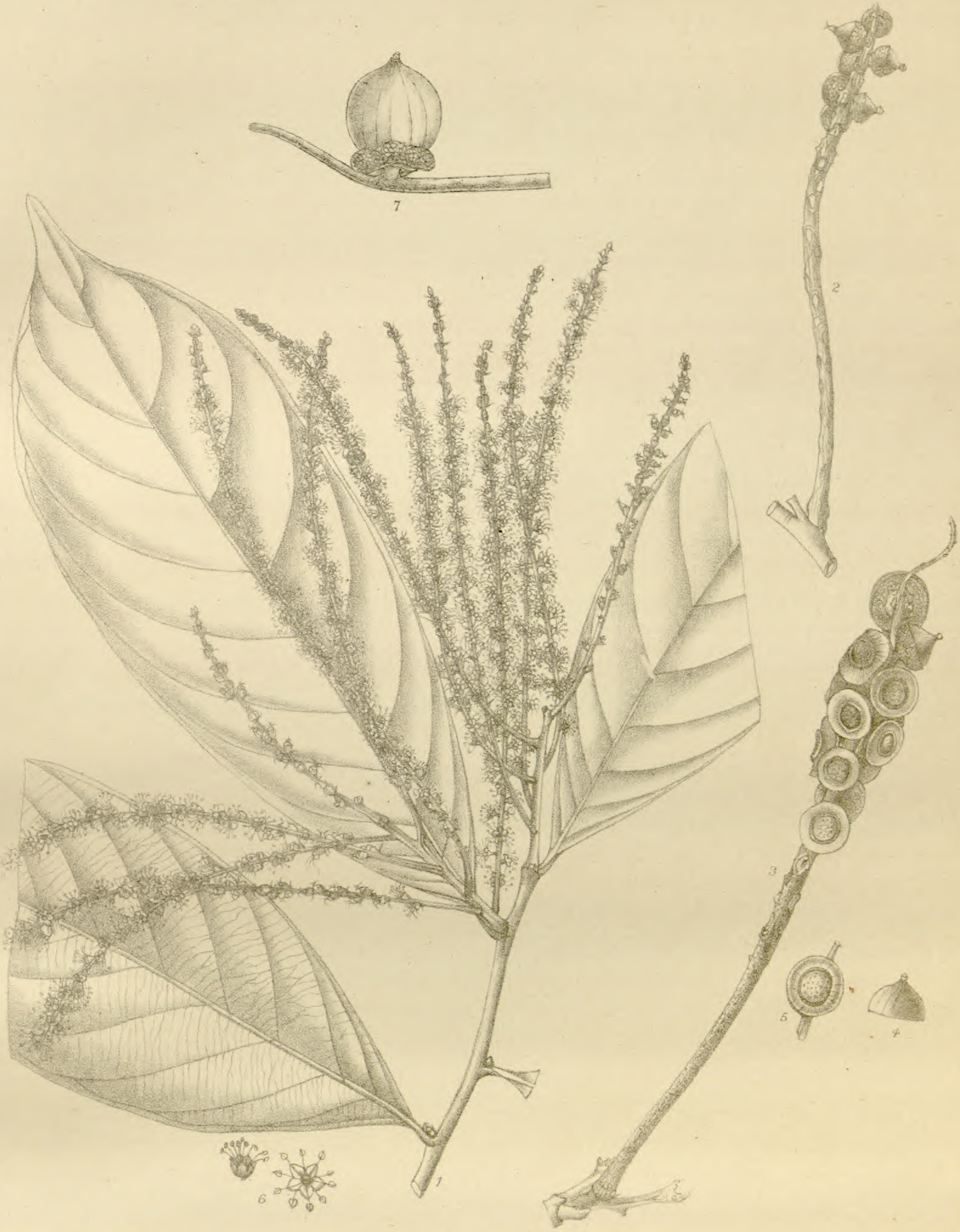
QUERCUS HYSTRIX, Korth.



G. C. Das. del Bot. Garden, Calcutta.

Lith by A. C. Singha, Govt. School of Art, Calcutta.

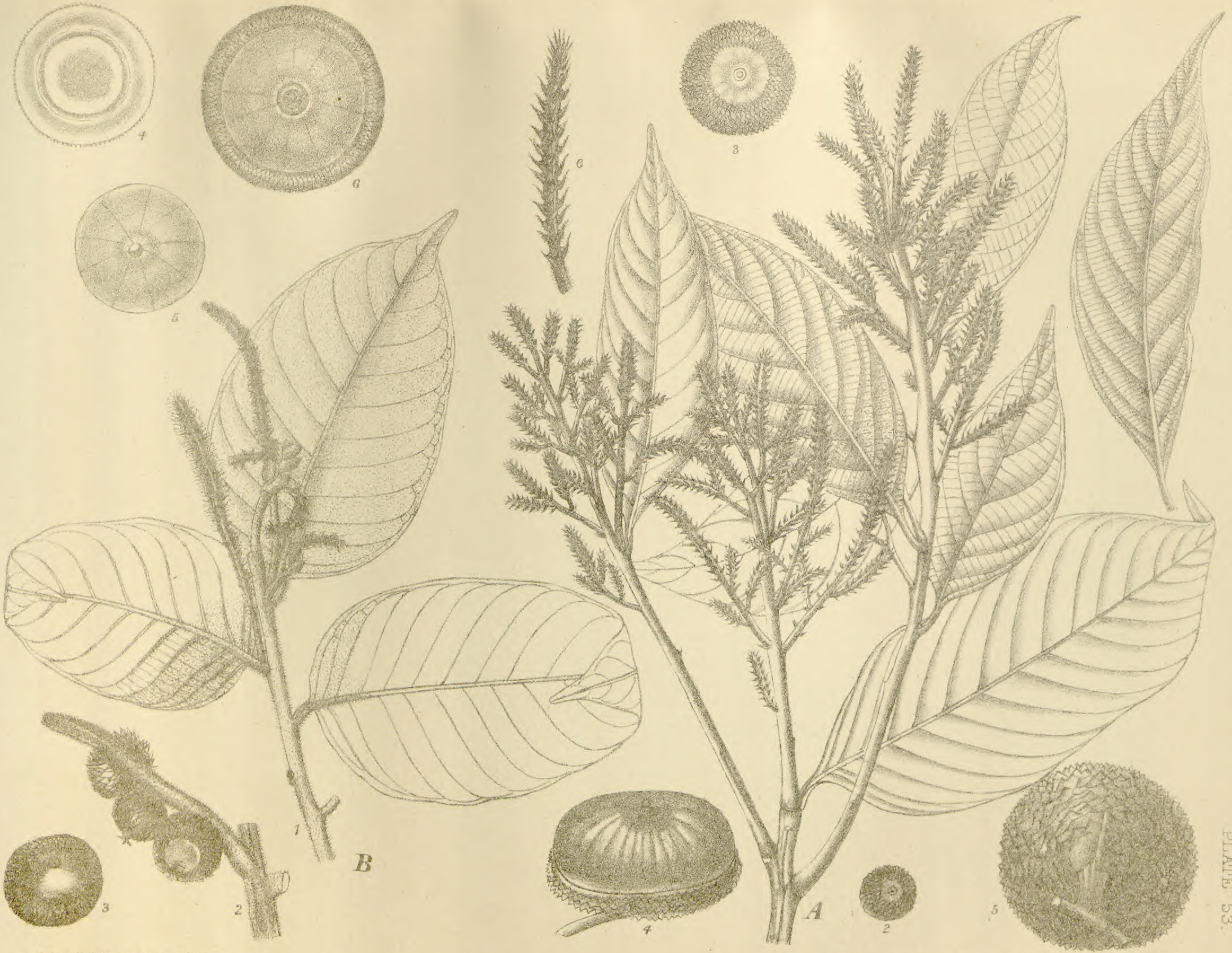
QUERCUS INDUTA, Bl.



G. C. Das, del. Bot. Garden Calcutta

Lith: by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

QUERCUS CURTISII, King.

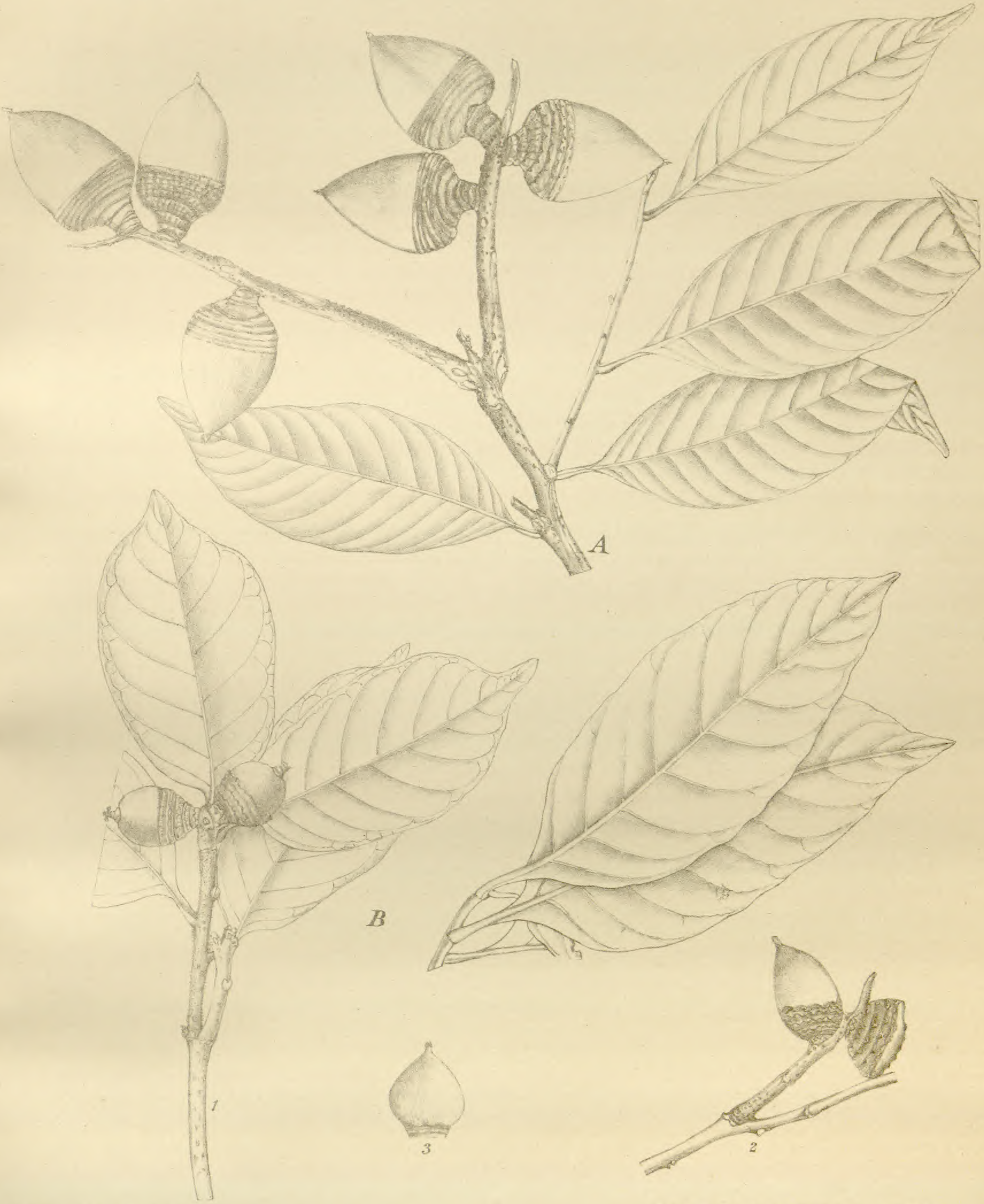


G. C. Das del. Bot. Garden Calcutta.

Lith: by A. C. Singha, Govt. School of Art, Calcutta.

QUERCUS PRUINOSA, Bl.

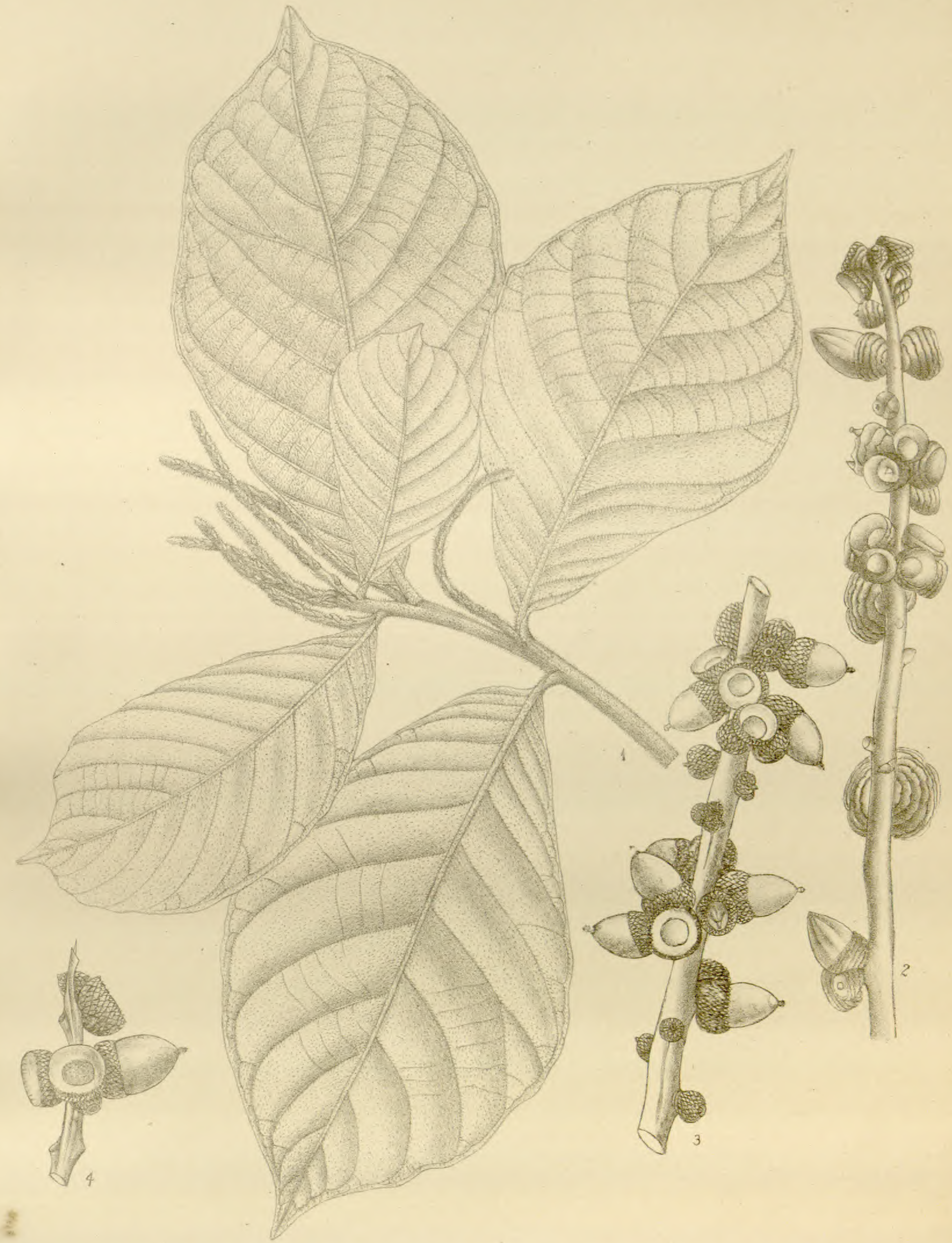
QUERCUS PALLIDA, Bl



G. C. Das del. Bot. Garden Calcutta.

Lith. by K. P. Das, Govt. School of Art, Calcutta.

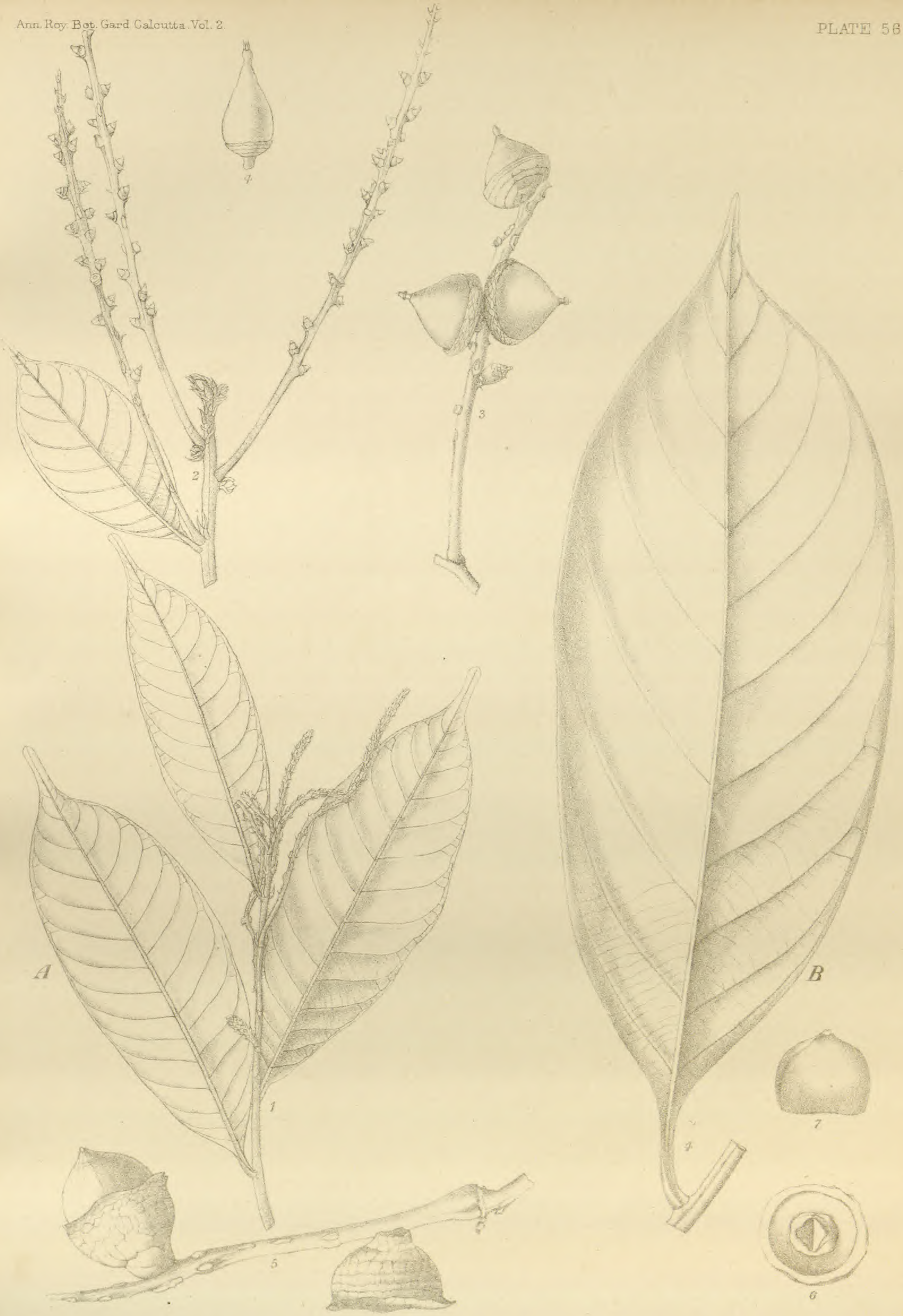
A. QUERCUS DAPHNOIDEA, Blume.
B. „ EUMORPHA, Kurz.



G. C. Das del. Bot. Garden Calcutta.

Lith. by J. C. Chuckerbutty Govt. School of Art, Calcutta.

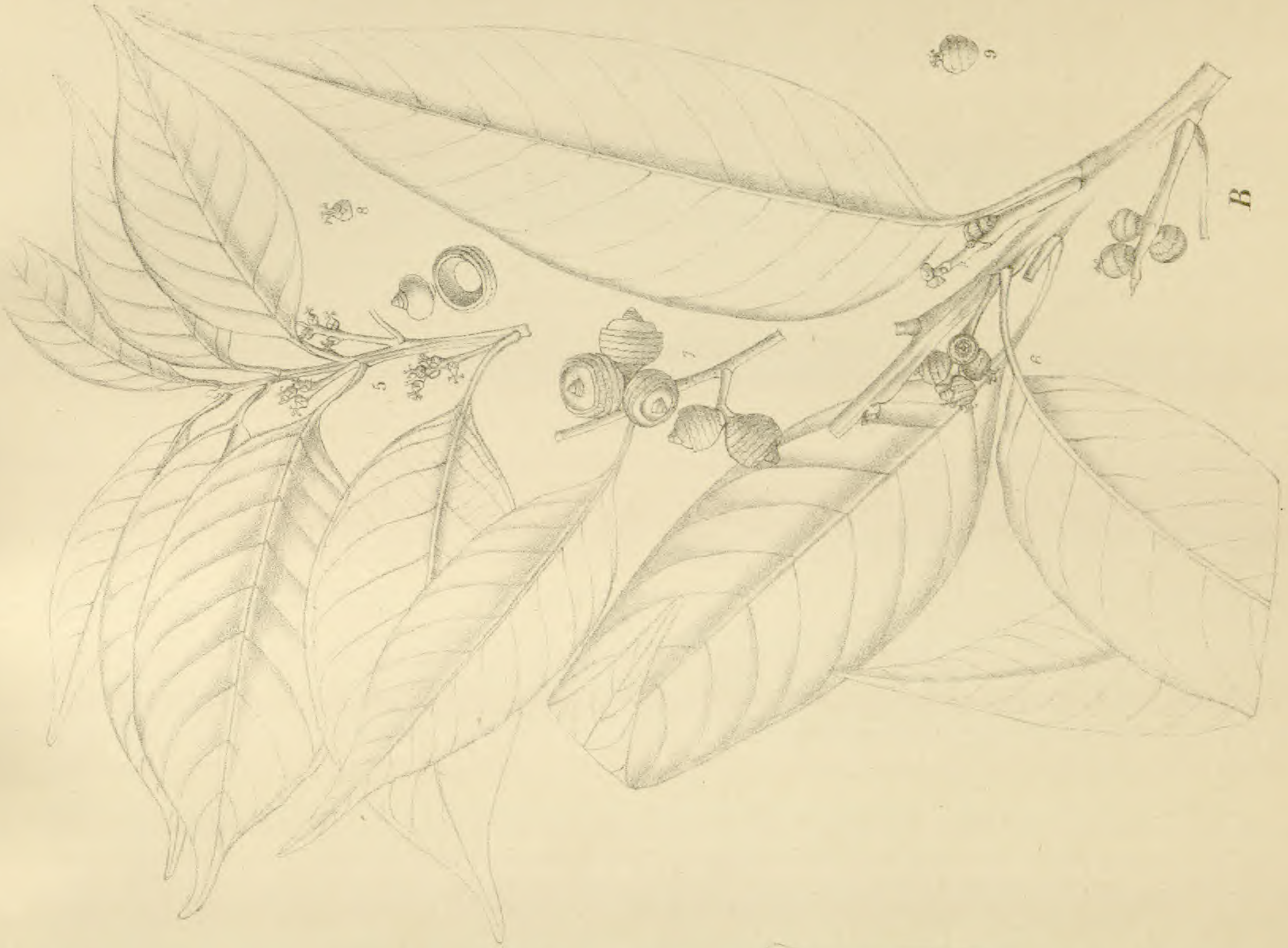
QUERCUS LINDLEYANA, Wall.



G. C. Das del. Bot. Garden Calcutta.

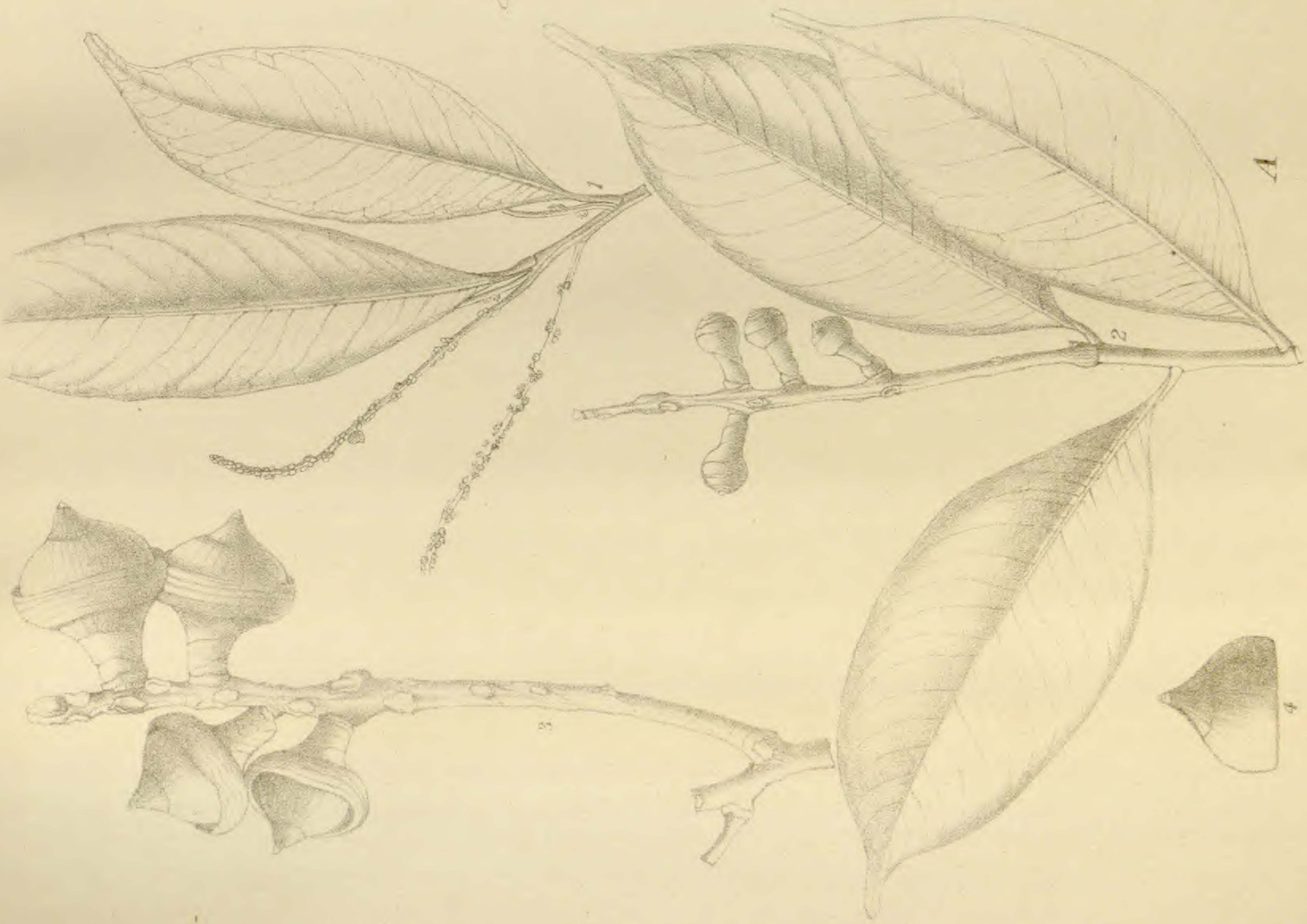
Lith by J. C. Chuckerbutty Govt. School of Art, Calcutta.

A. QUERCUS CONOCARPA, Oudem.
B. „ BANCANA, Scheff.



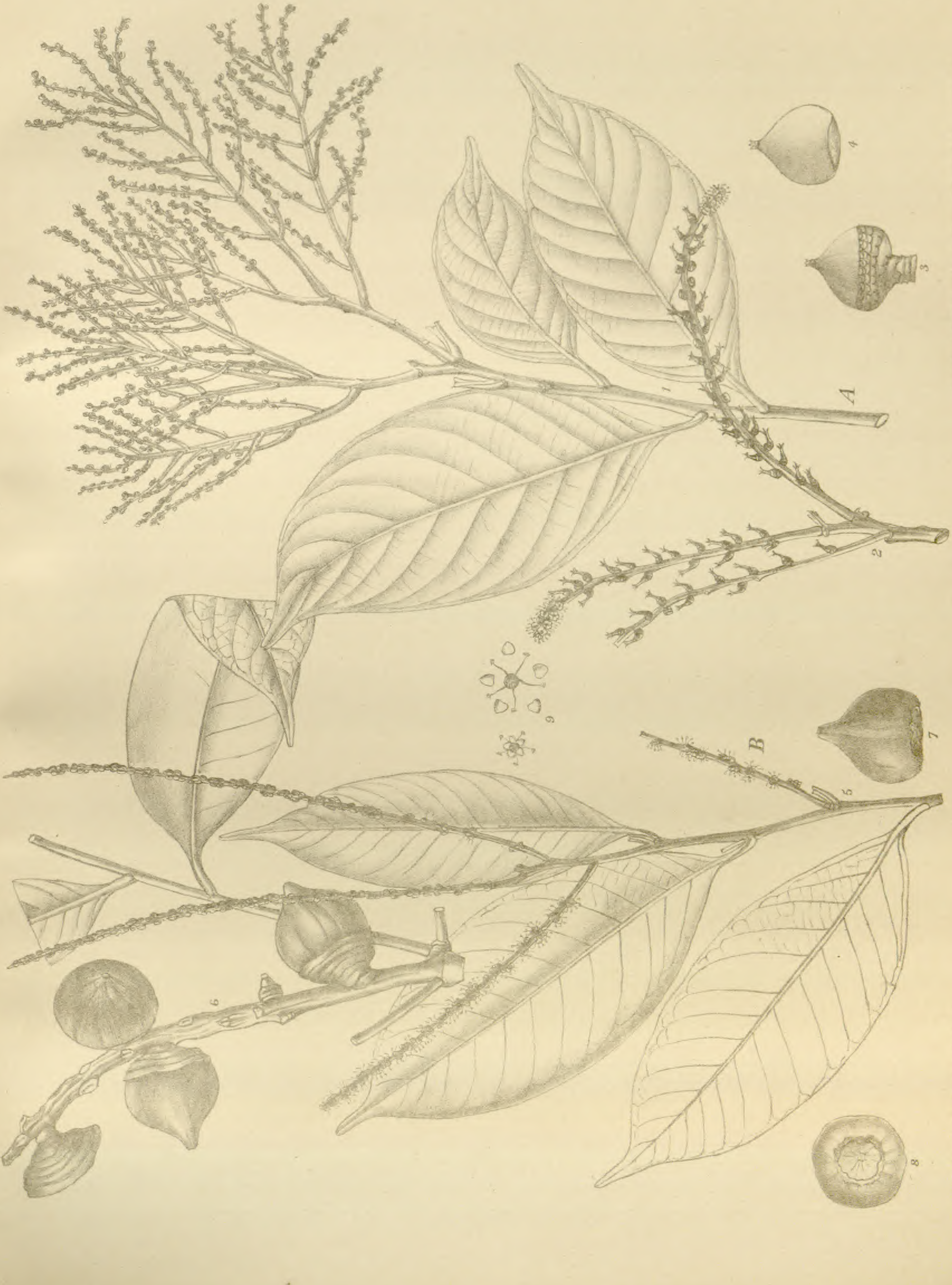
QUERCUS SERICEA, Scheff.

Lith: by J.C. Ghuckerbutty Govt. School of Art, Calcutta.



QUERCUS REINWARDTII, Korth.

G.C. Das del. Bot Garden Calcutta

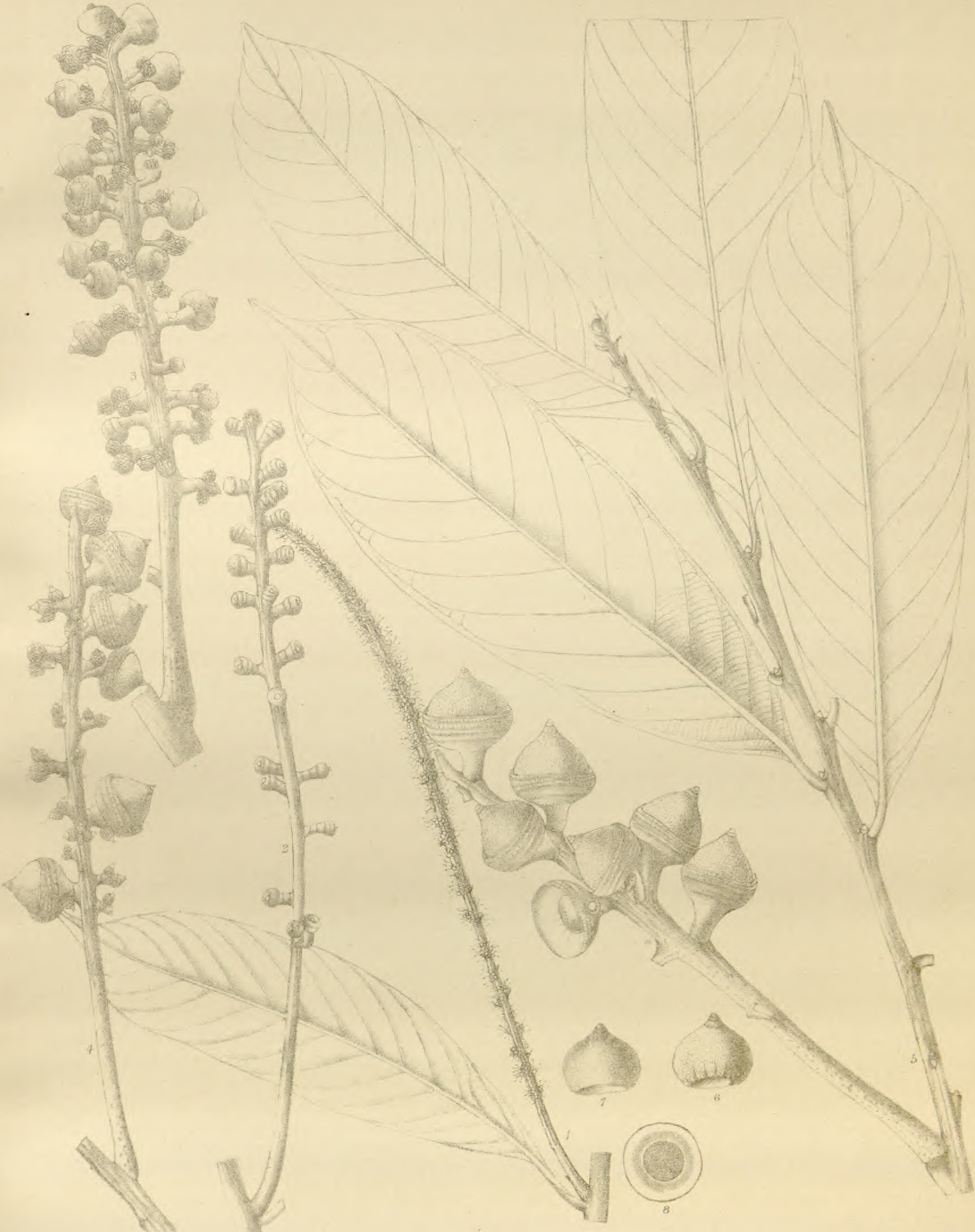


QUERCUS BENNETTII, Miq.

QUERCUS WENZIGIANA, King

G. C. Das del. Bot. Garden Calcutta.

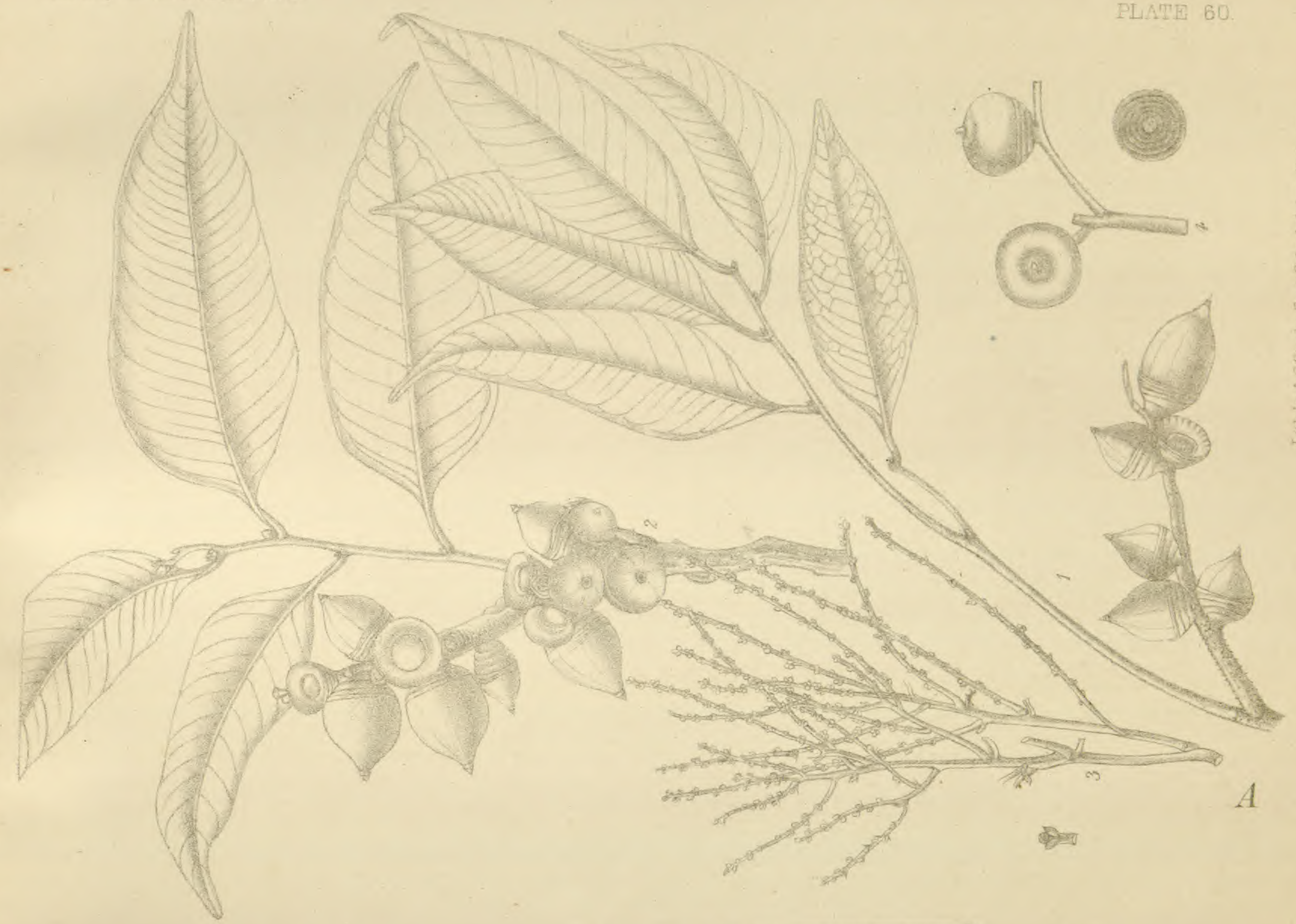
Lith. by J. K. Bhattacharji, Govt. School of Art, Calcutta.



G. C. Das del. Bot. Garden Calcutta.

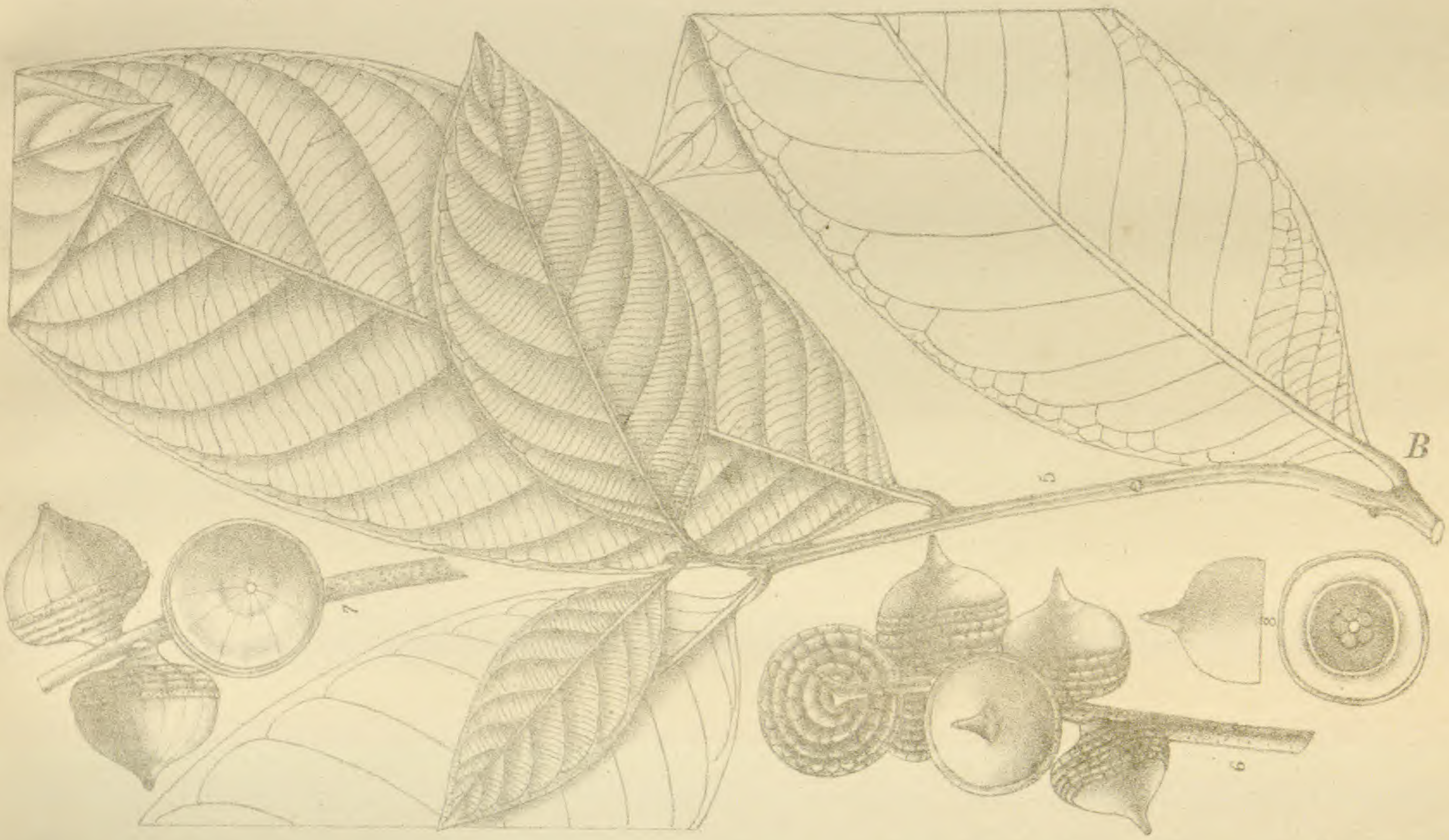
Lith: by J. C. Chuckerbutty Govt: School of Art, Calcutta.

QUERCUS CANTLEYANA, King.



QUERCUS RASSA, Miq

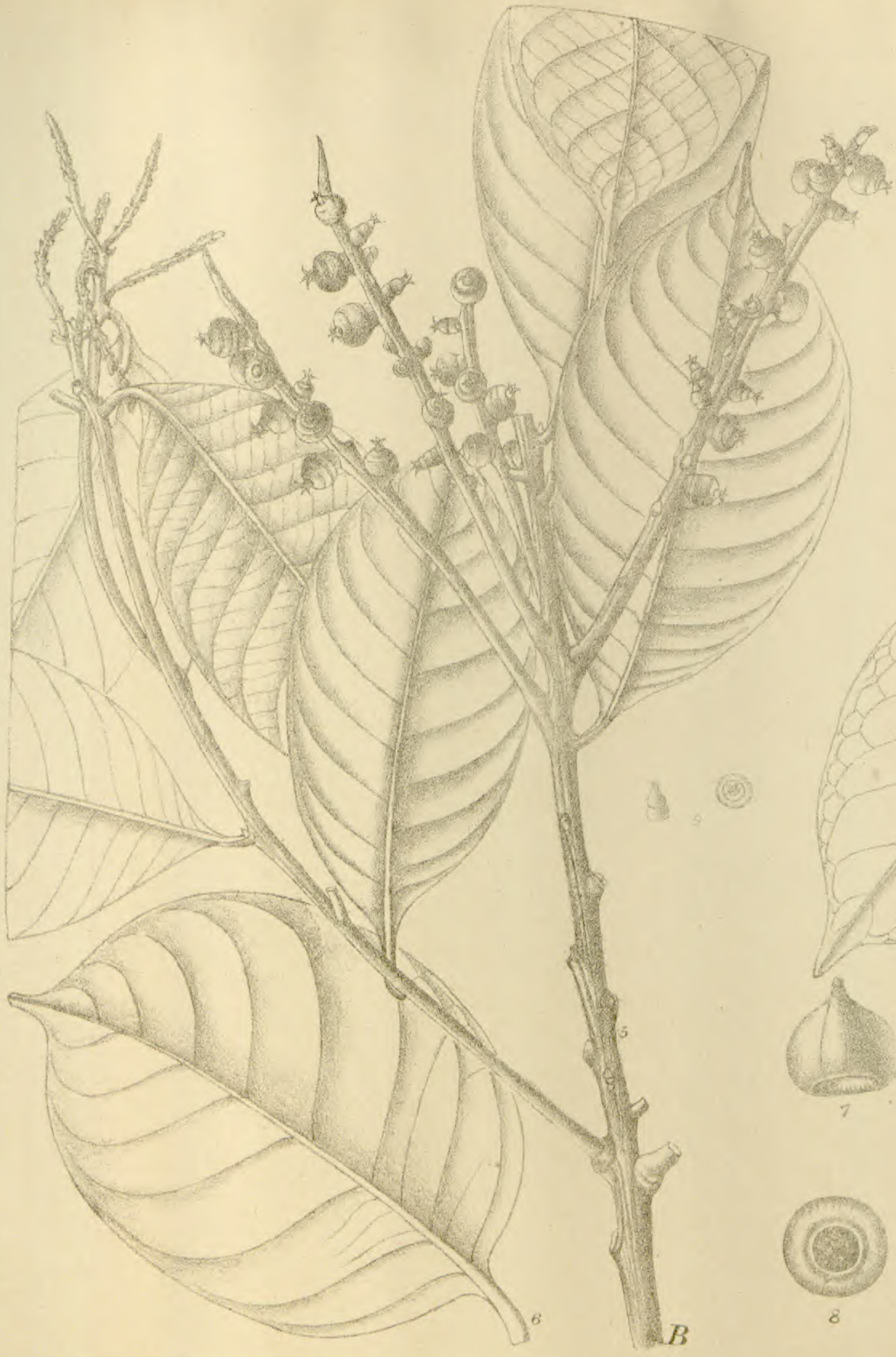
Lith by A.C.Singha Govt. School of Art, Calcutta.

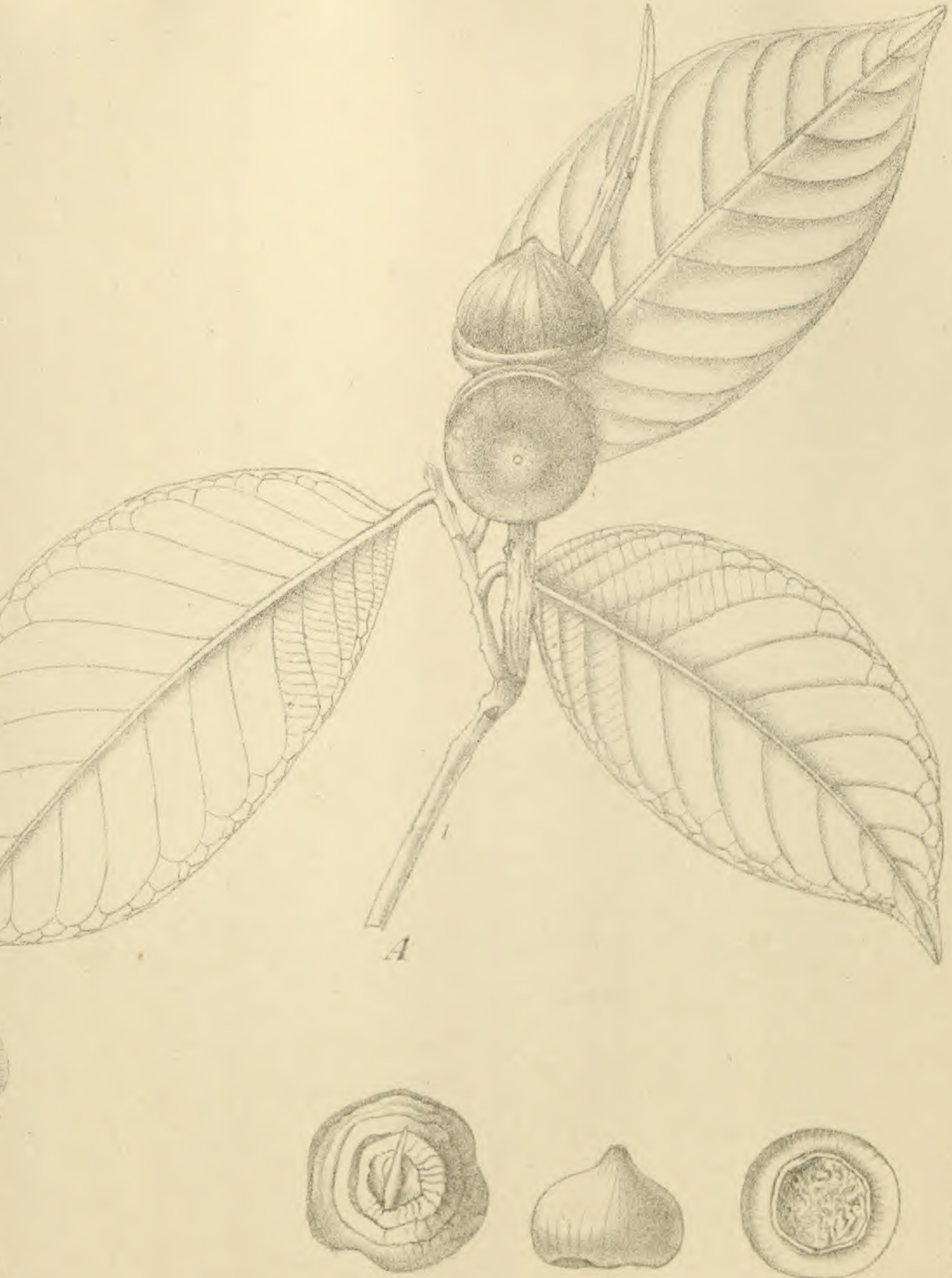


QUERCUS CYRTORHYNCHA, Miq.

G.C.Das del. Bot. Garden Calcutta.

PLATE 61



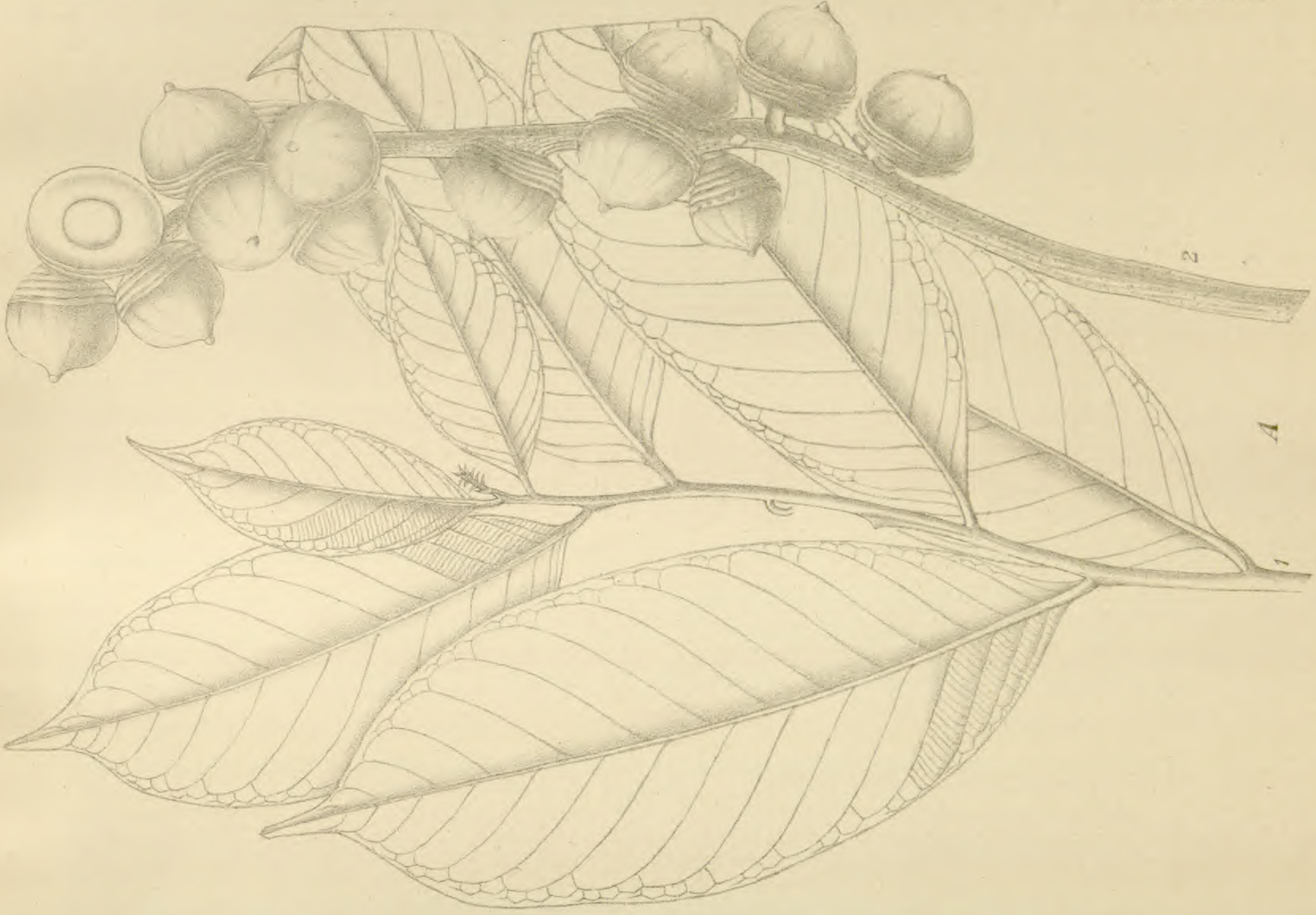


G. C. Das del. Bot. Garden Calcutta.

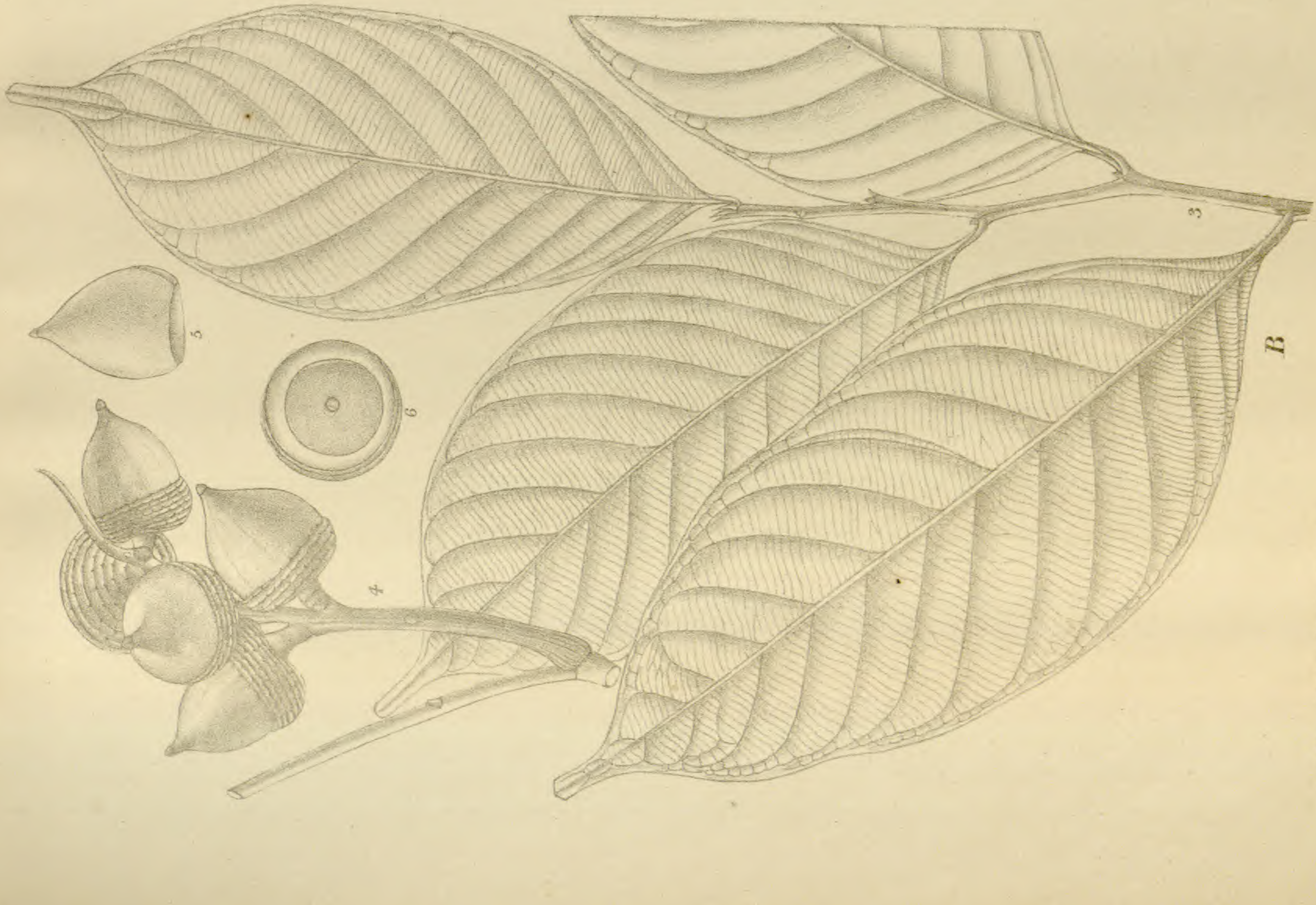
Lith. by A. C. Singha, Govt. School of Art, Calcutta.

QUERCUS RAJAH, Hance.

QUERCUS DIEPENHORSTII, Miq.



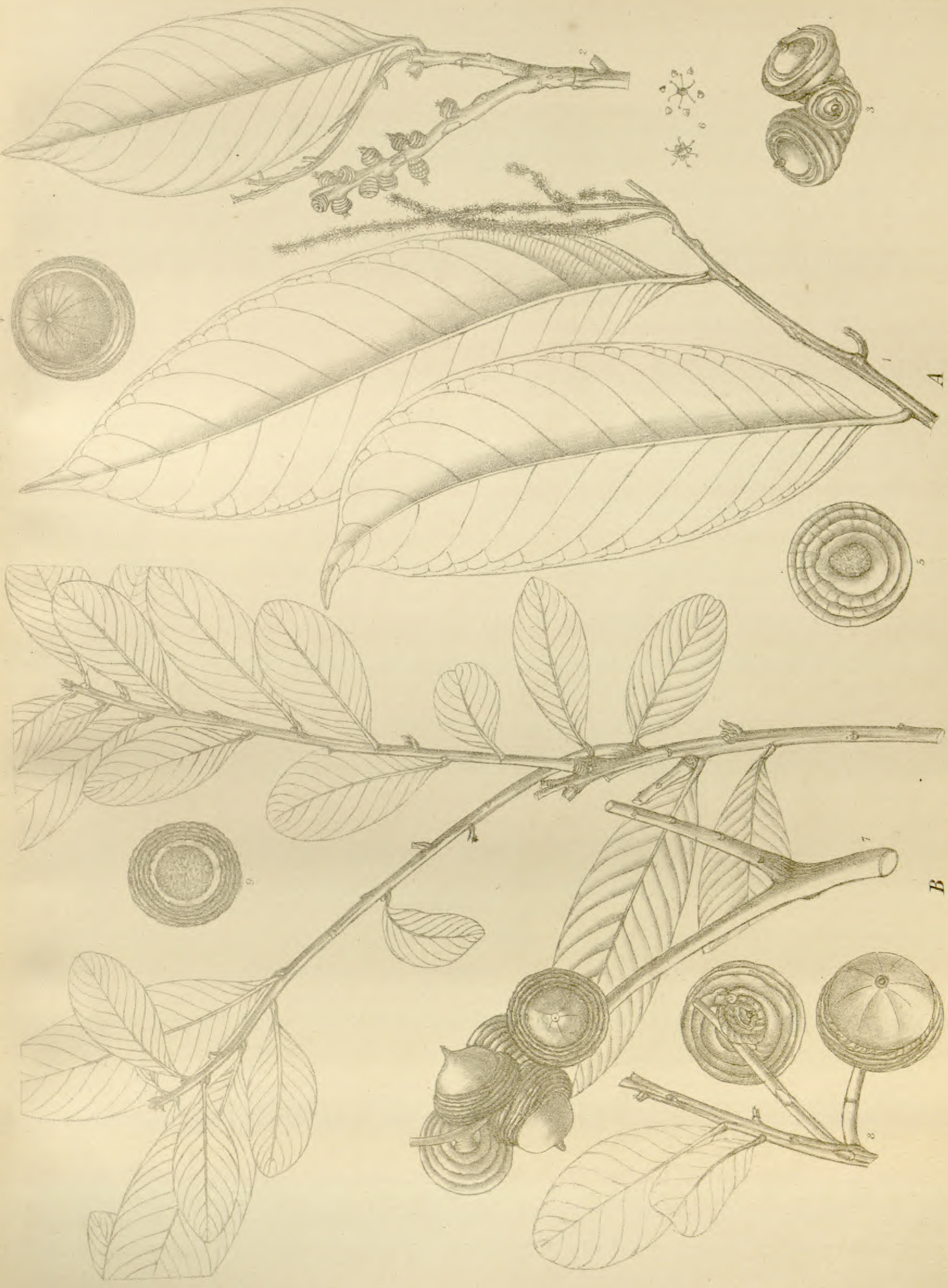
QUERCUS EWYCKII, Korth.



QUERCUS EWYCKII, Korth. var. latifolia.

G. C. Das del Bot. Garden Calcutta.

Lith by A. C. Singha Govt. School of Art, Calcutta.

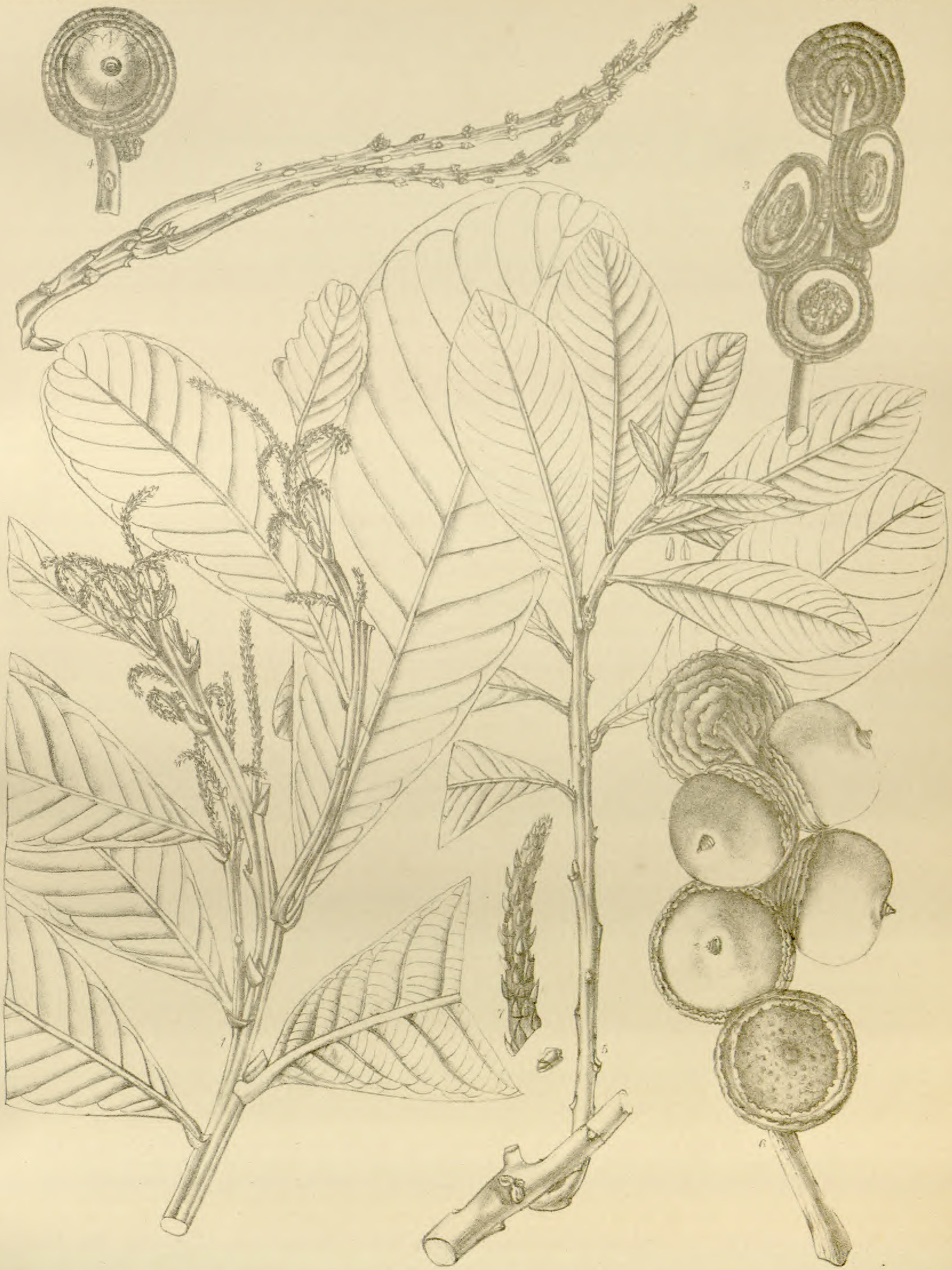


G. C. Das, del. Bot. Garden, Calcutta.

QUERCUS OMALKOS, Korth.

Lith. by K. P. Das, Govt. School of Art, Calcutta.

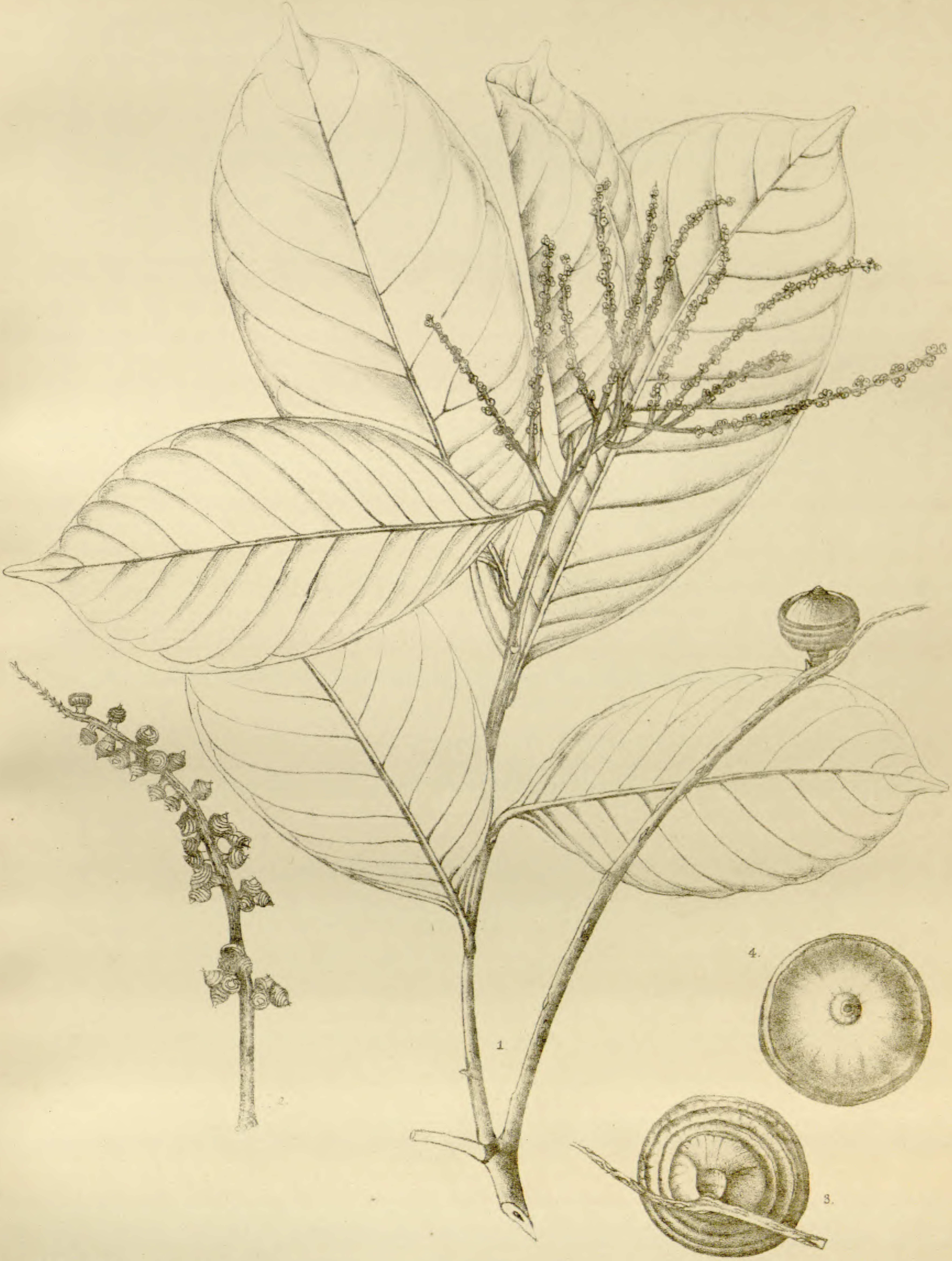
QUERCUS CLEMENTIANA, King.



G. C. Das del. Bot. Garden Calcutta.

Lith. by J. C. Bhattacharji Govt. School of Art, Calcutta.

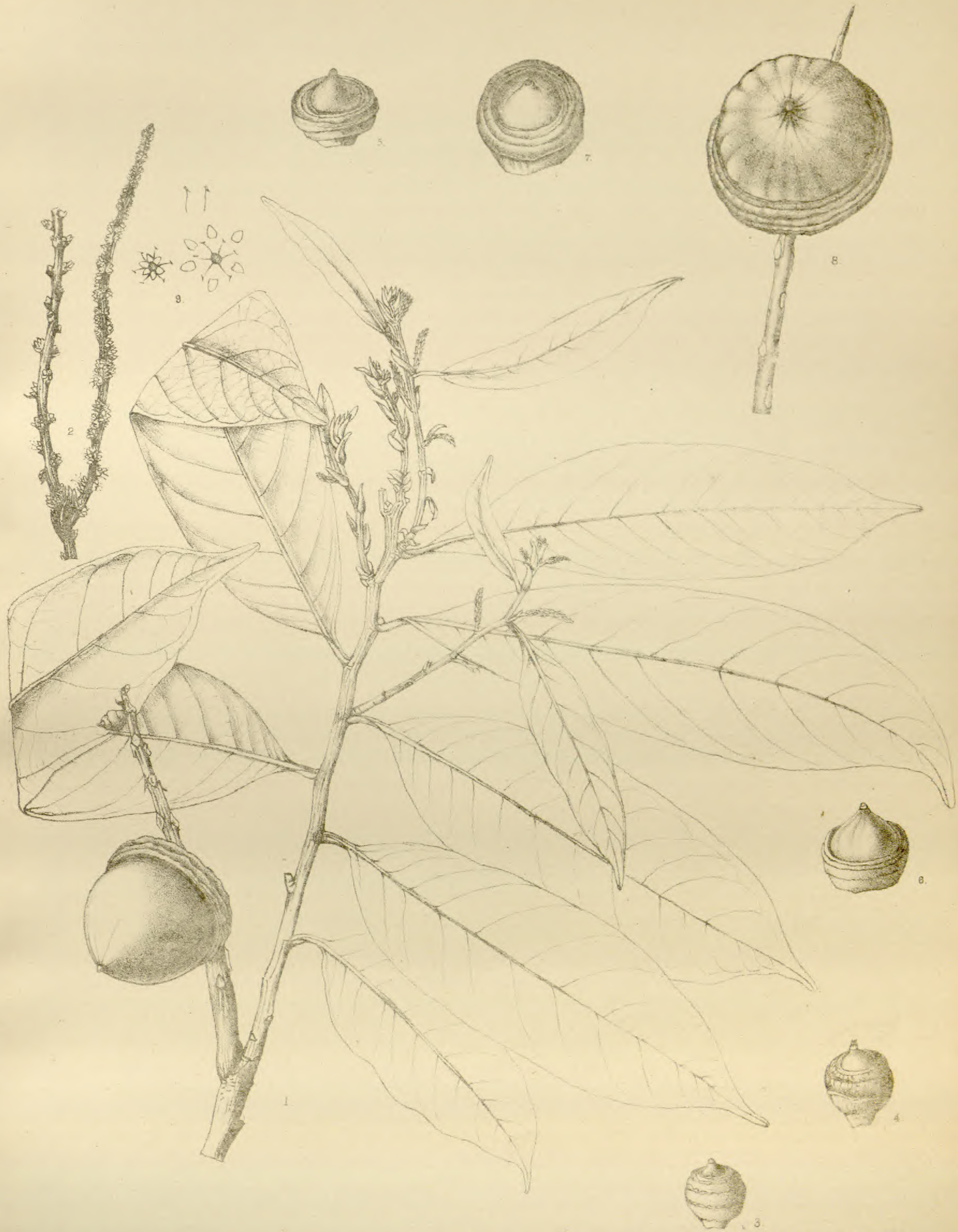
QUERCUS LUCIDA, Roxb.



G. C. Das del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

QUERCUS PLATYCARPA, Bl.

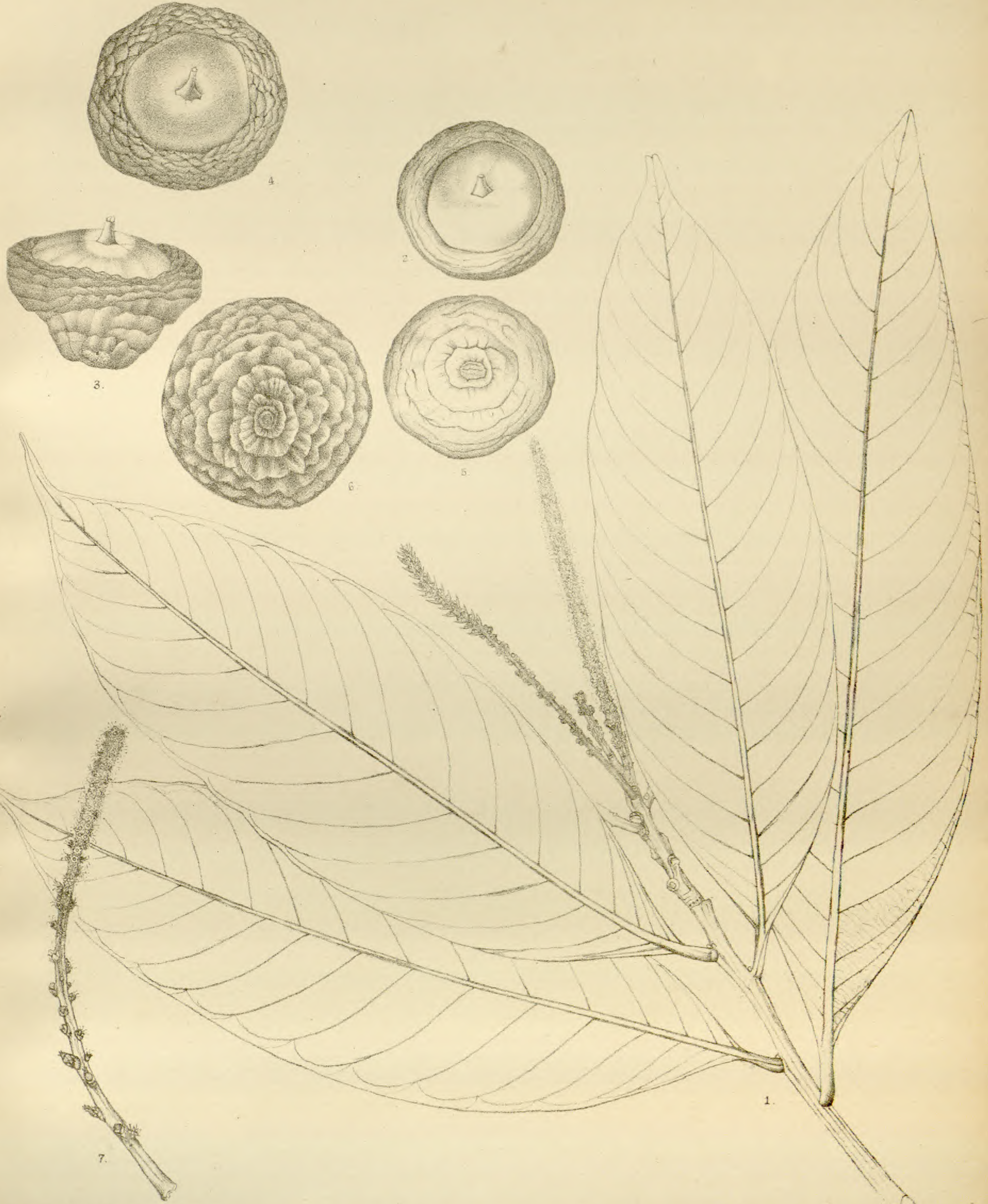


G. C. Das del Bot. Garden, Calcutta

Lith. and Printed by Kristohari Das.

QUERCUS TEYSMANNII, Blume.

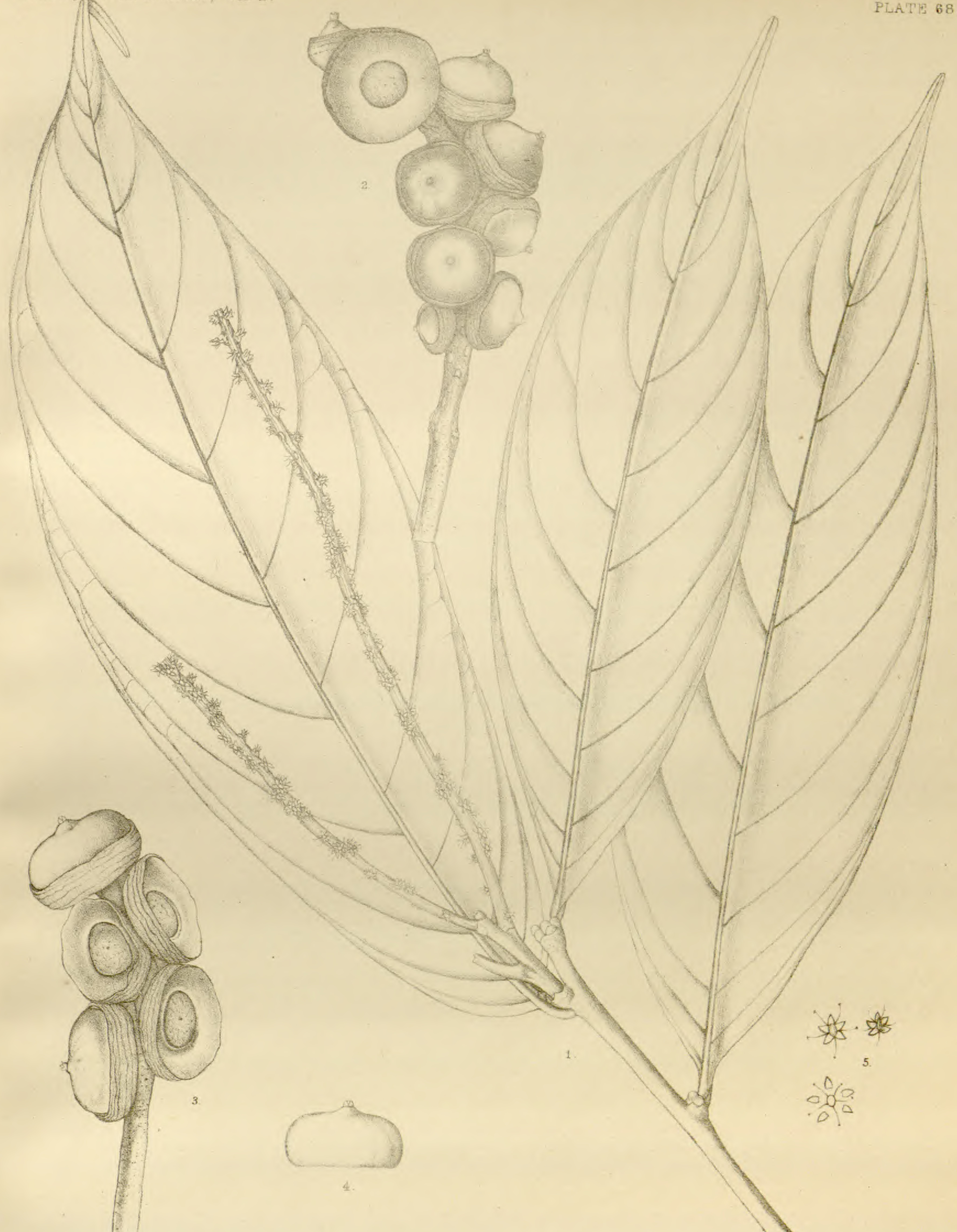
PLATE 67.



A. L. Sing'h, del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

QUERCUS CYCLOPHORA, Endl.



G. C. Das, Del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

QUERCUS EICHLERI, Wenzig.

PLATE 69.

A.
1.
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B
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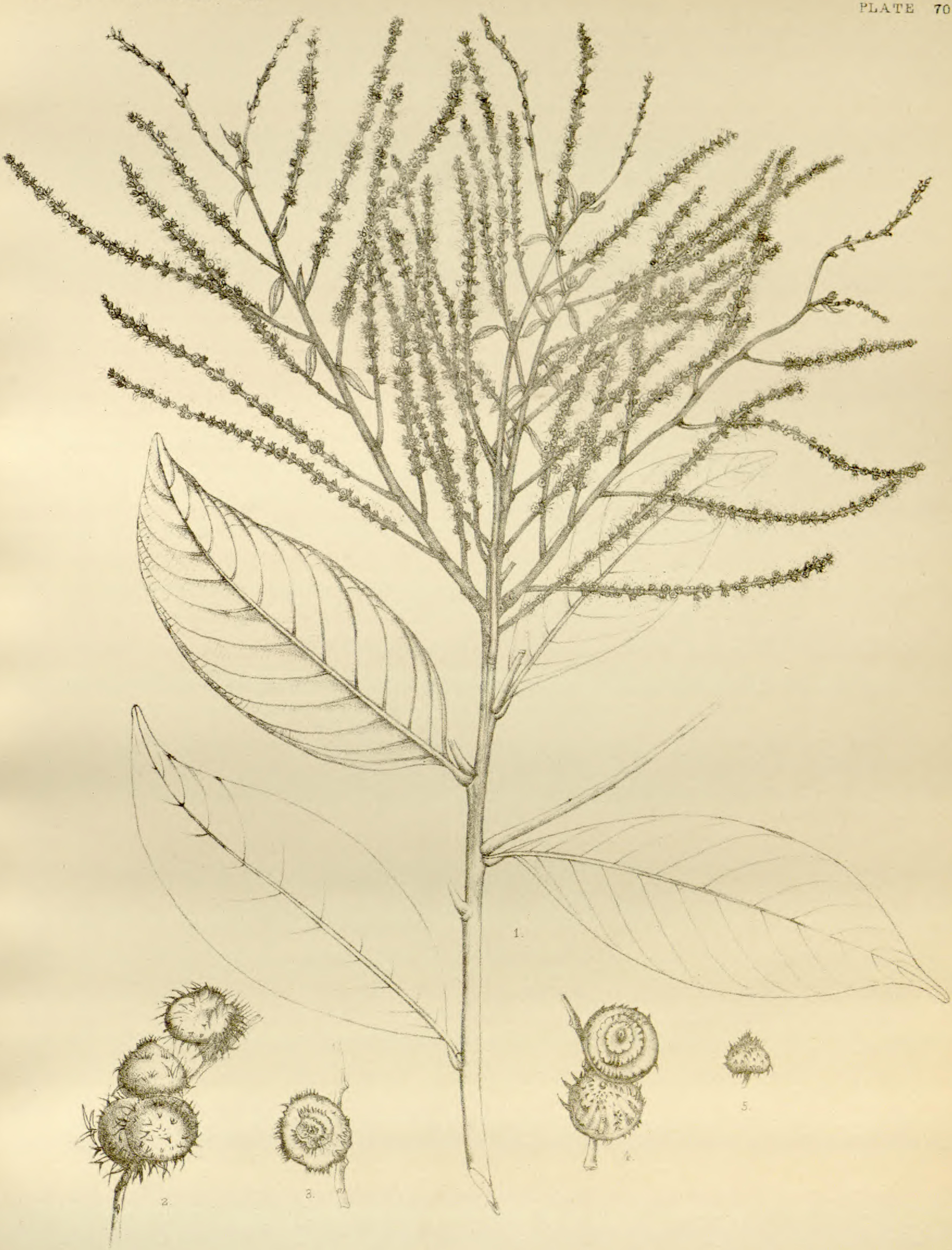
14.

Lith: and Printed by Kristohari Das.

QUERCUS THOMSONI, Miq.

QUERCUS BLUMEANA, Korth.

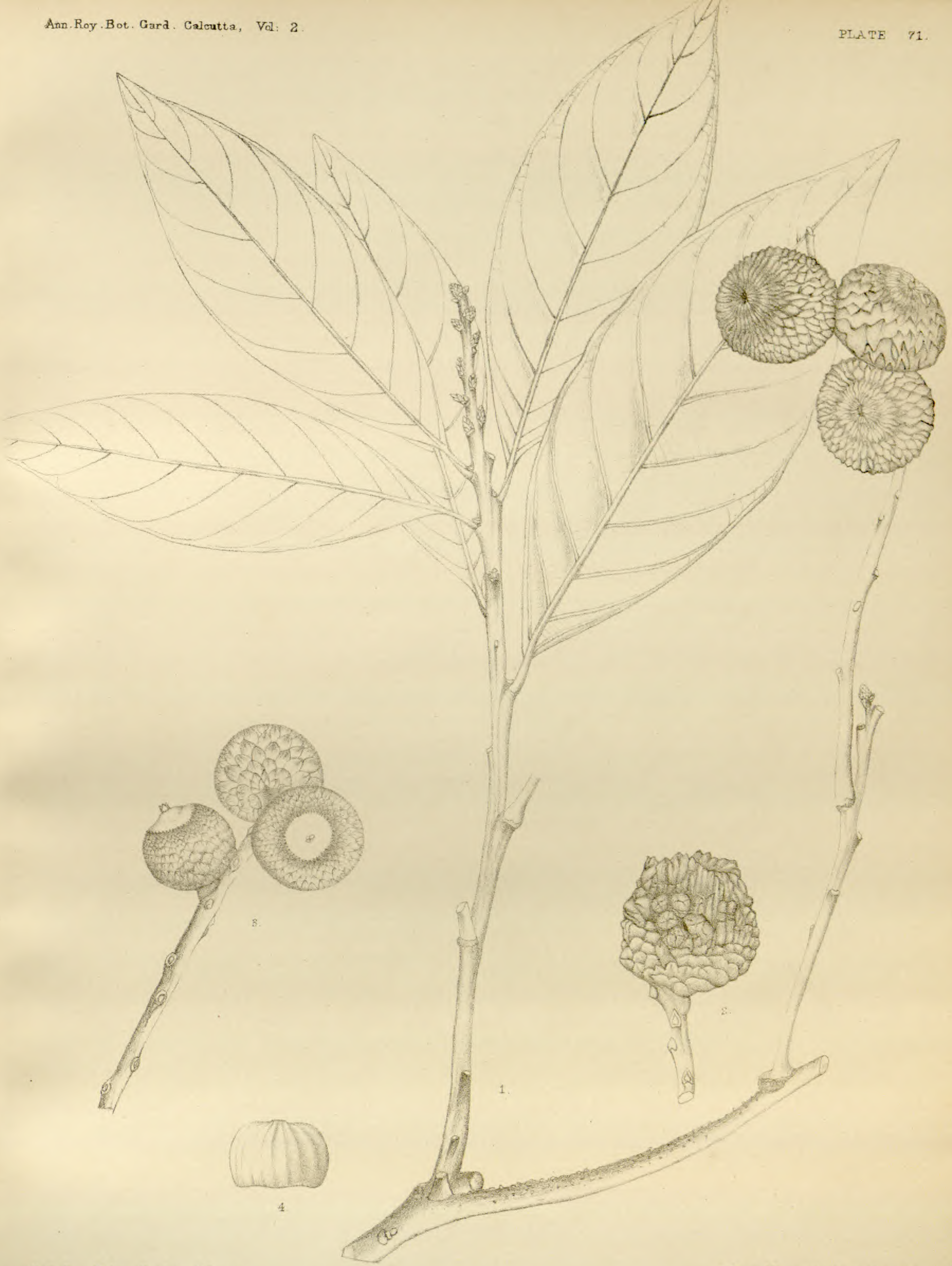
G.C.Das del Bot. Garden, Calcutta.



G. C. Das, del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

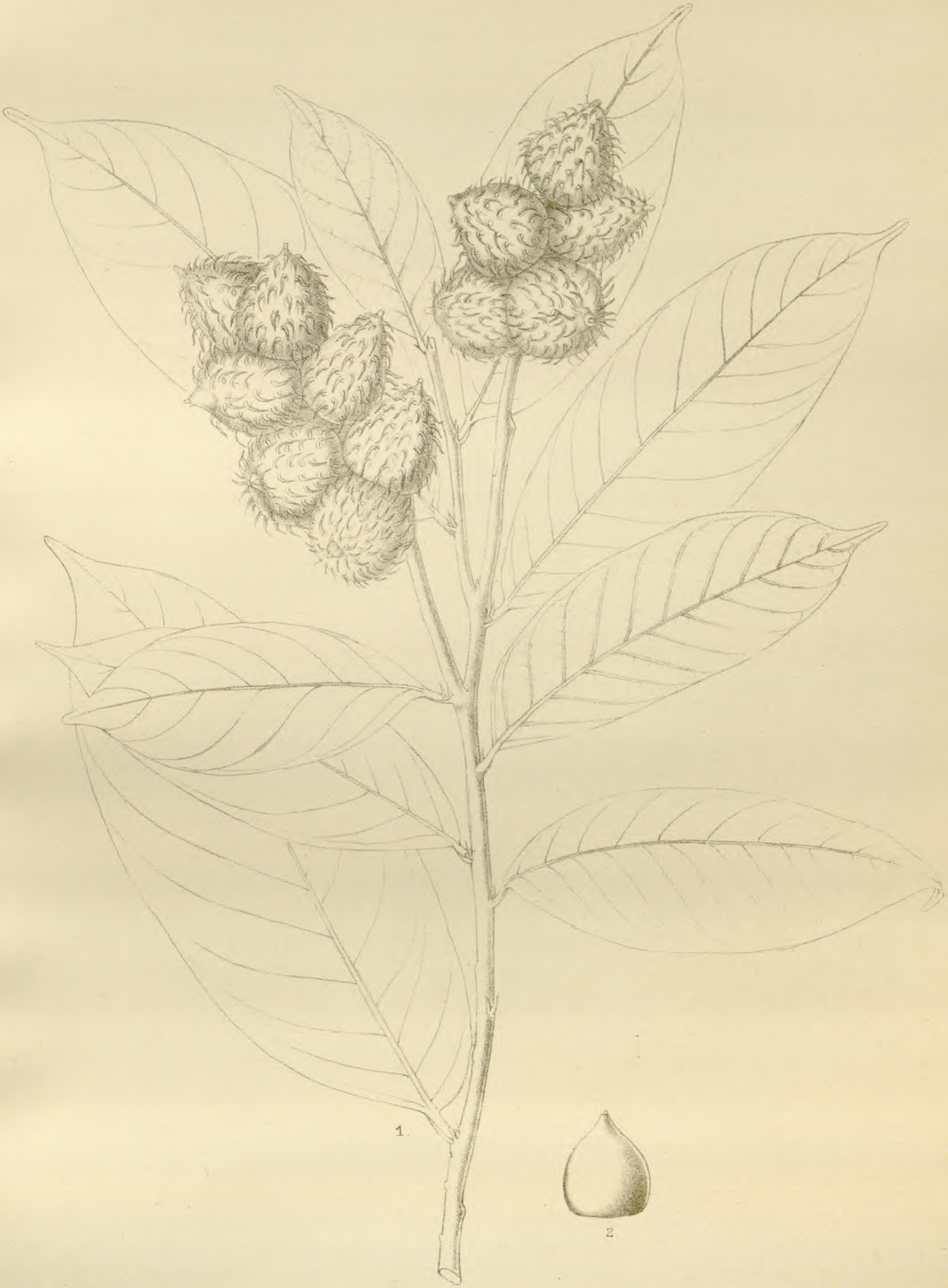
QUERCUS DISCOCARPA, Hance.



G. C. Das del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

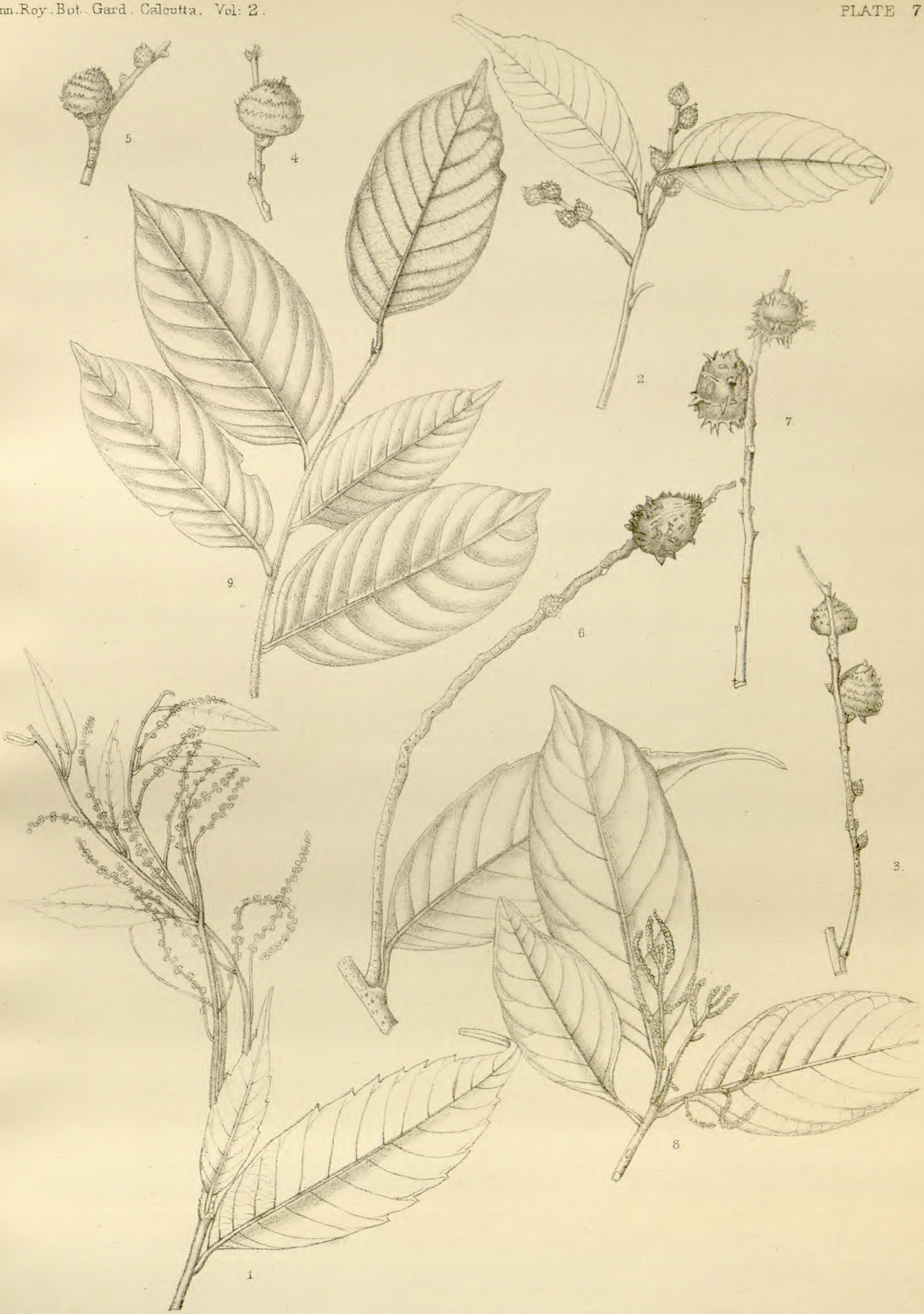
QUERCUS CONFRAGOSA, King.



M. Smith del.

Lith: and Printed by Kristohari Das.

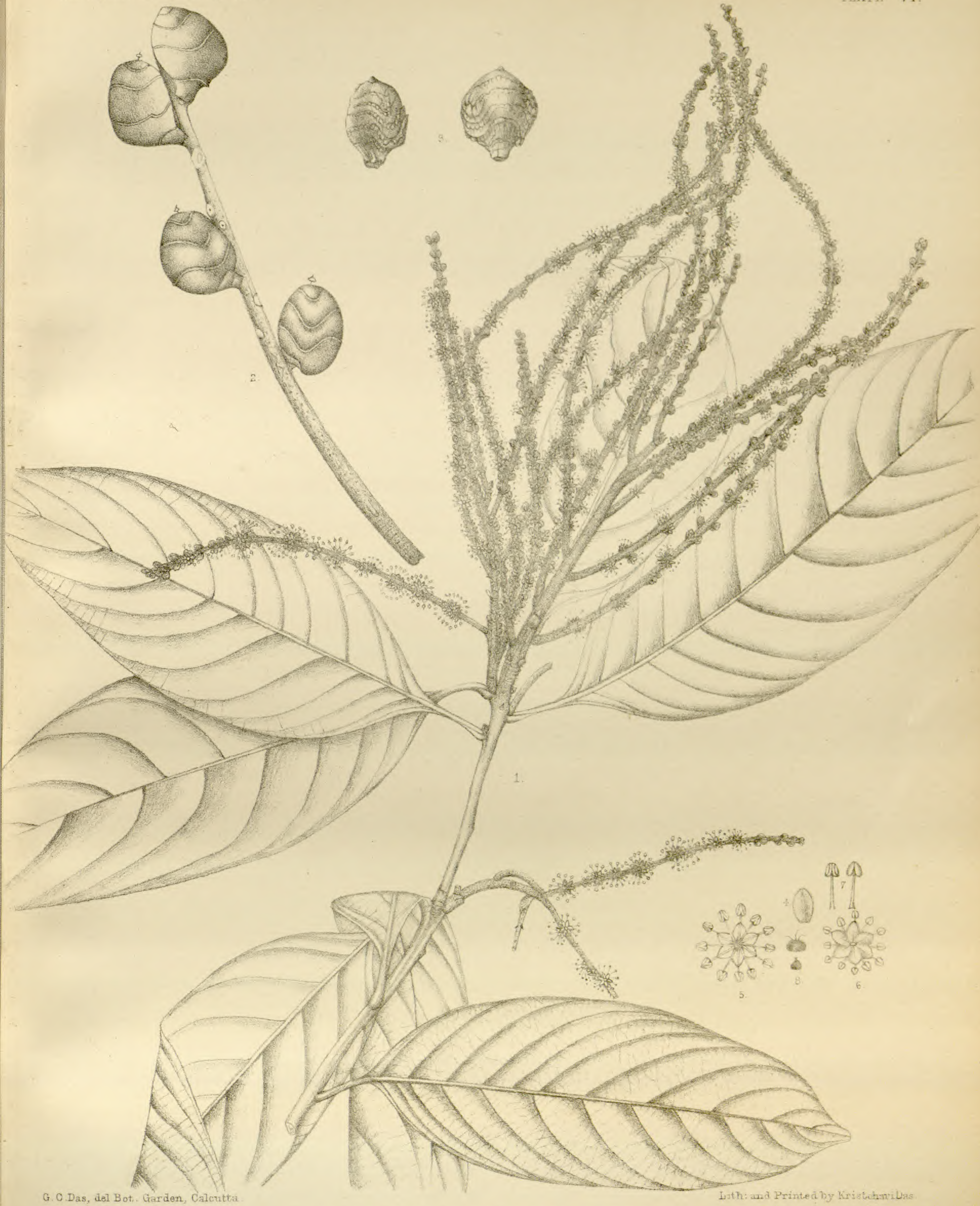
QUERCUS REFLEXA, King.



A.L. Singh, del Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

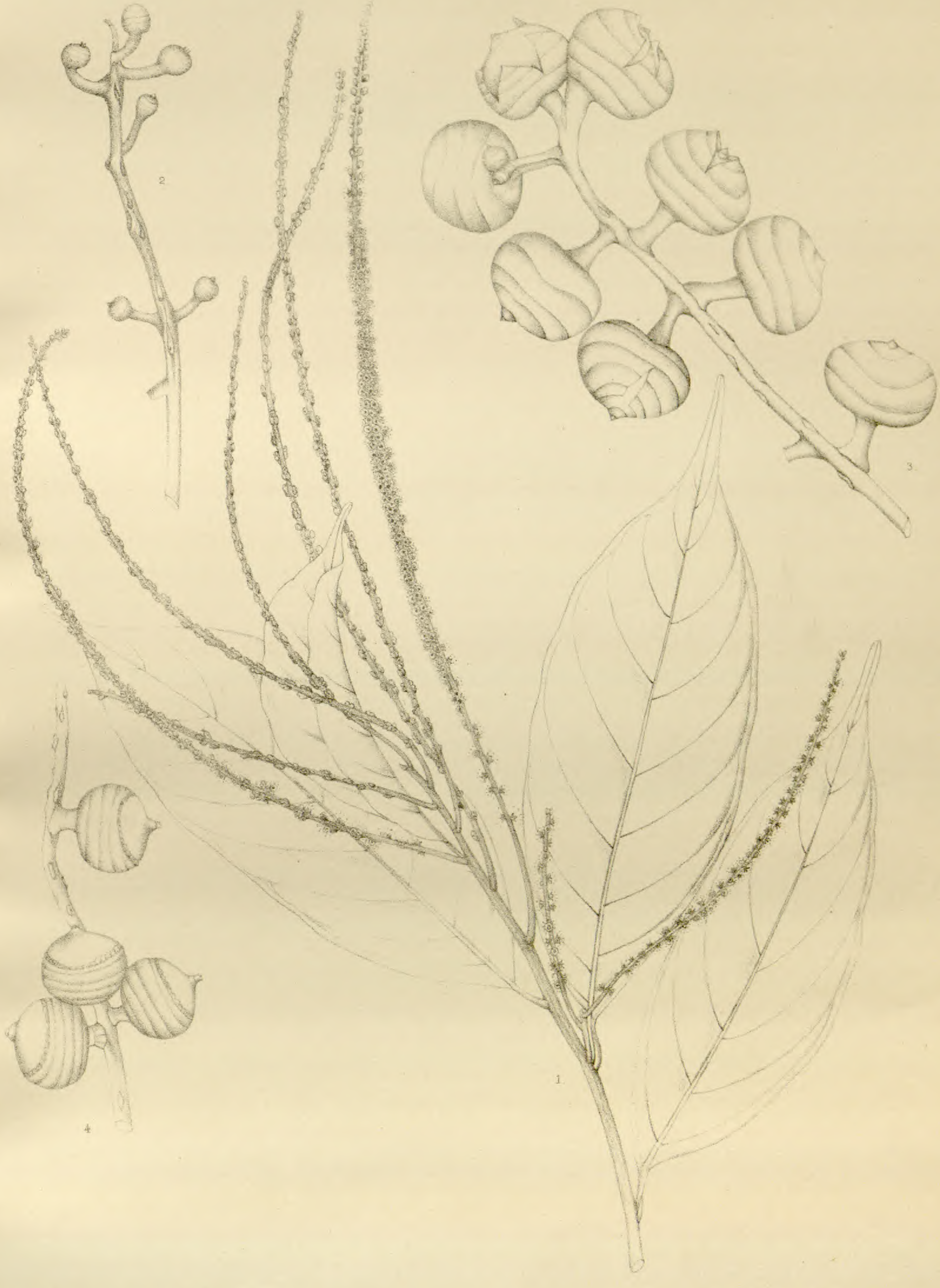
QUERCUS JUNGHUHNII, Miq.



G. C. Das, del Bot. Garden, Calcutta.

Lith: and Printed by Kristchmi Das.

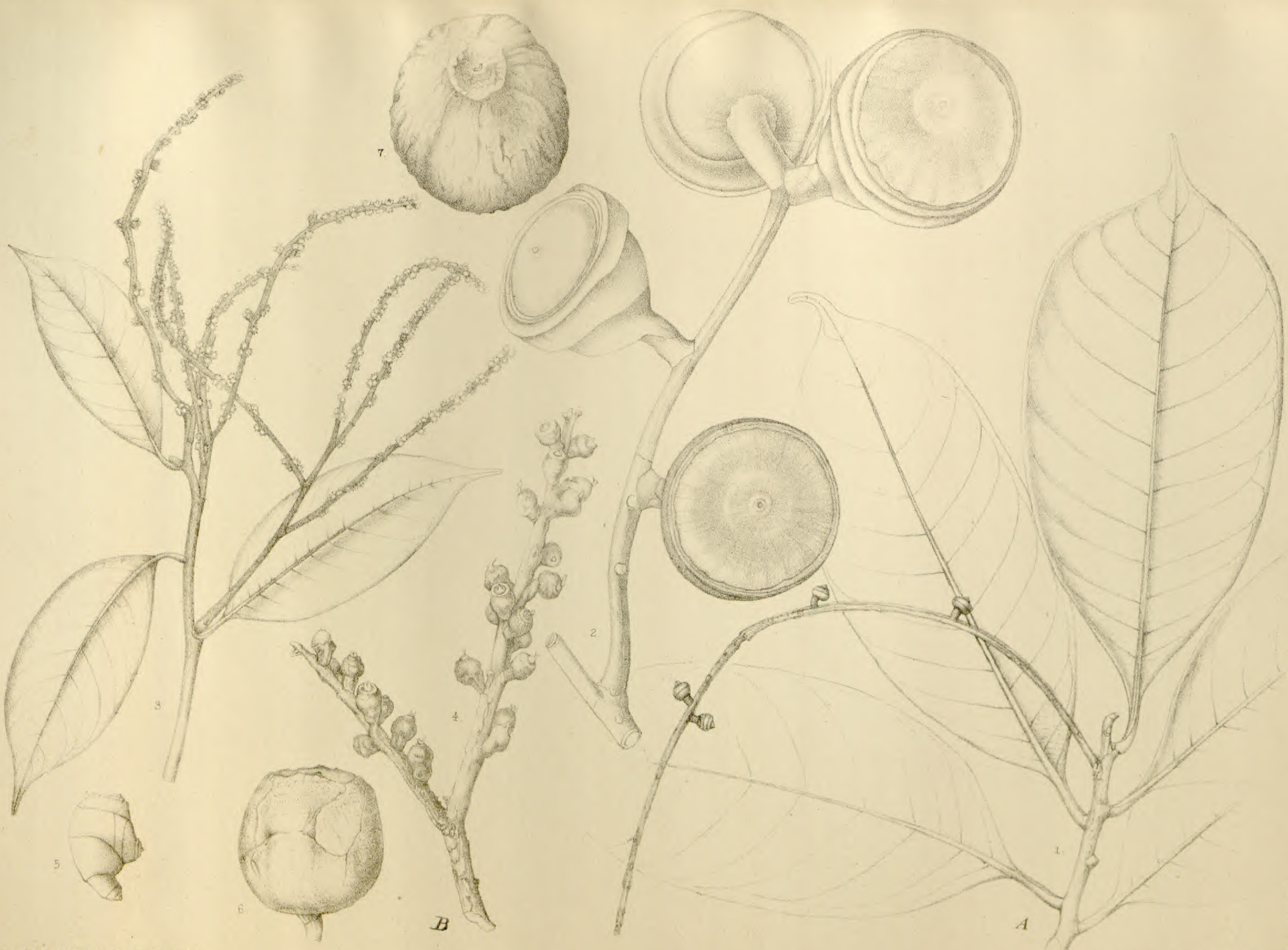
QUERCUS LANCEAEFOLIA, Roxb.



G. C. Das del Bot. Garden, Calcutta.

Lith: and Prited by Kristohari Das.

QUERCUS ENCLEISOCARPA, Korth.

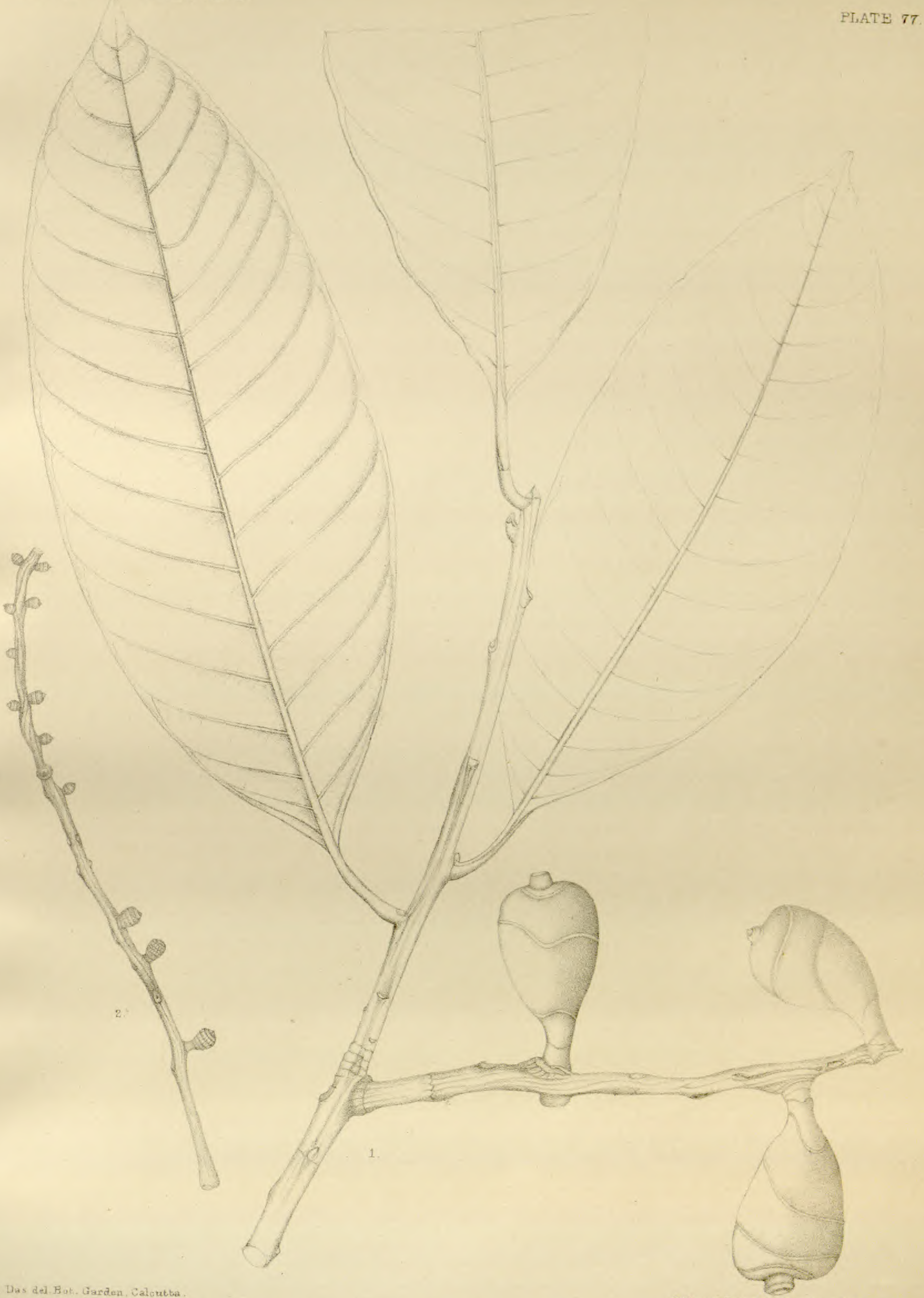


A. L. Singh. del Bot. Garden, Calcutta.

Lith. and Printed by Kristohari Das

QUERCUS JAVENSIS, Miq.

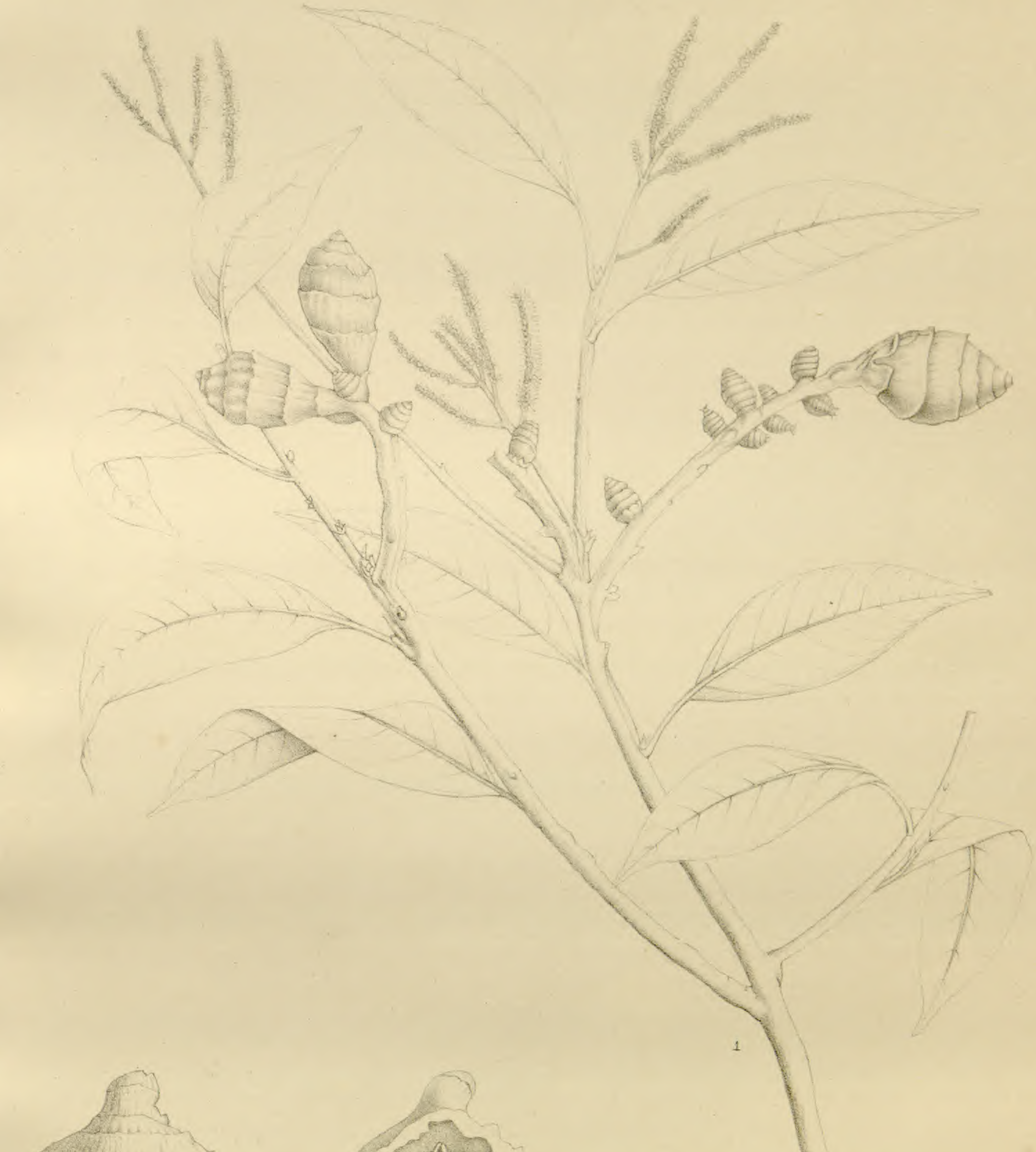
QUERCUS COSTATA, Bl. var. convexa



G. C. Das del. Bot. Garden, Calcutta.

Lith: and Printed by Kristohari Das.

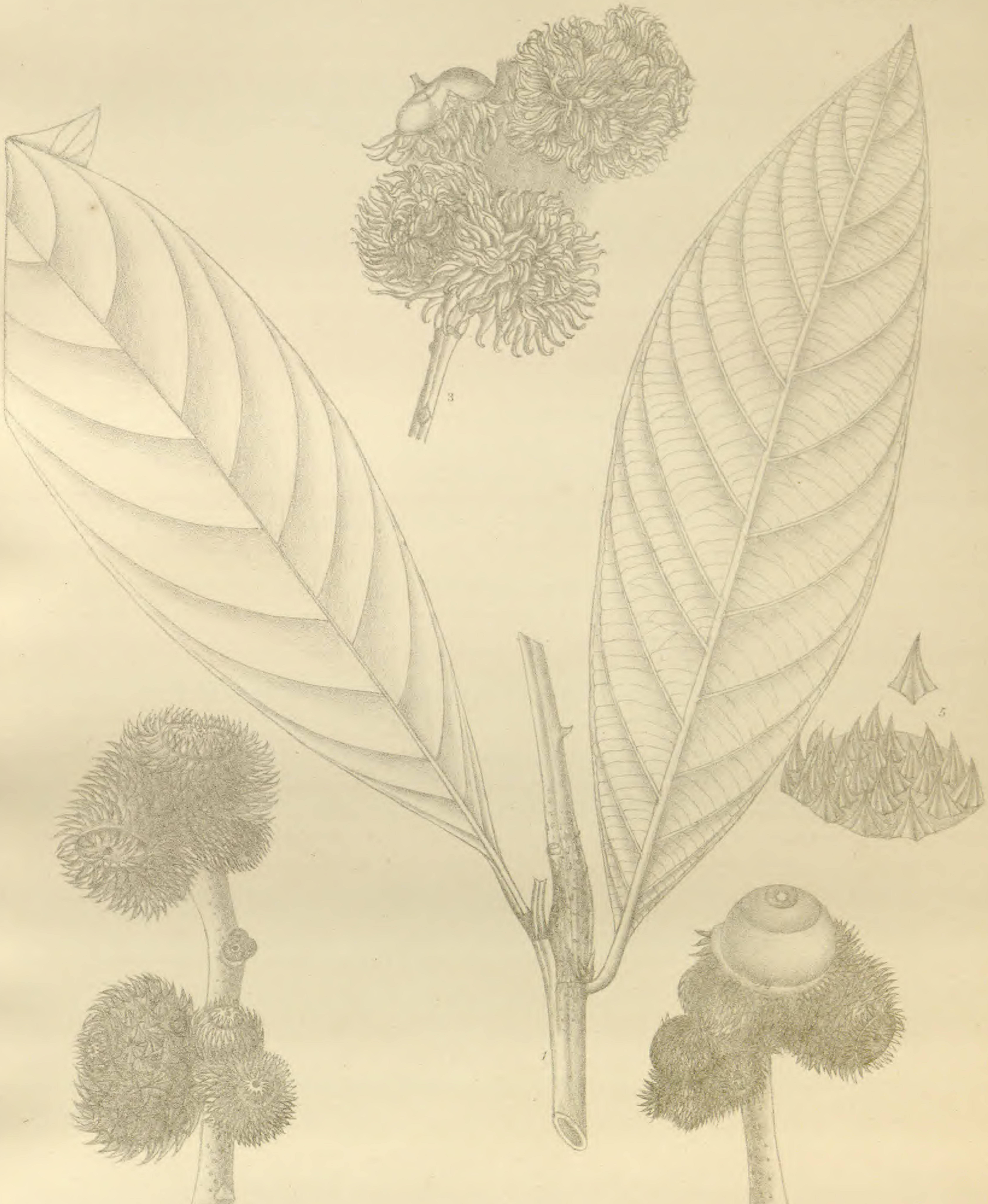
QUERCUS MAINGAYII, Benth.



G.C.Das del Bot Garden, Calcutta.

Lith. and Printed by Kristohari Das.

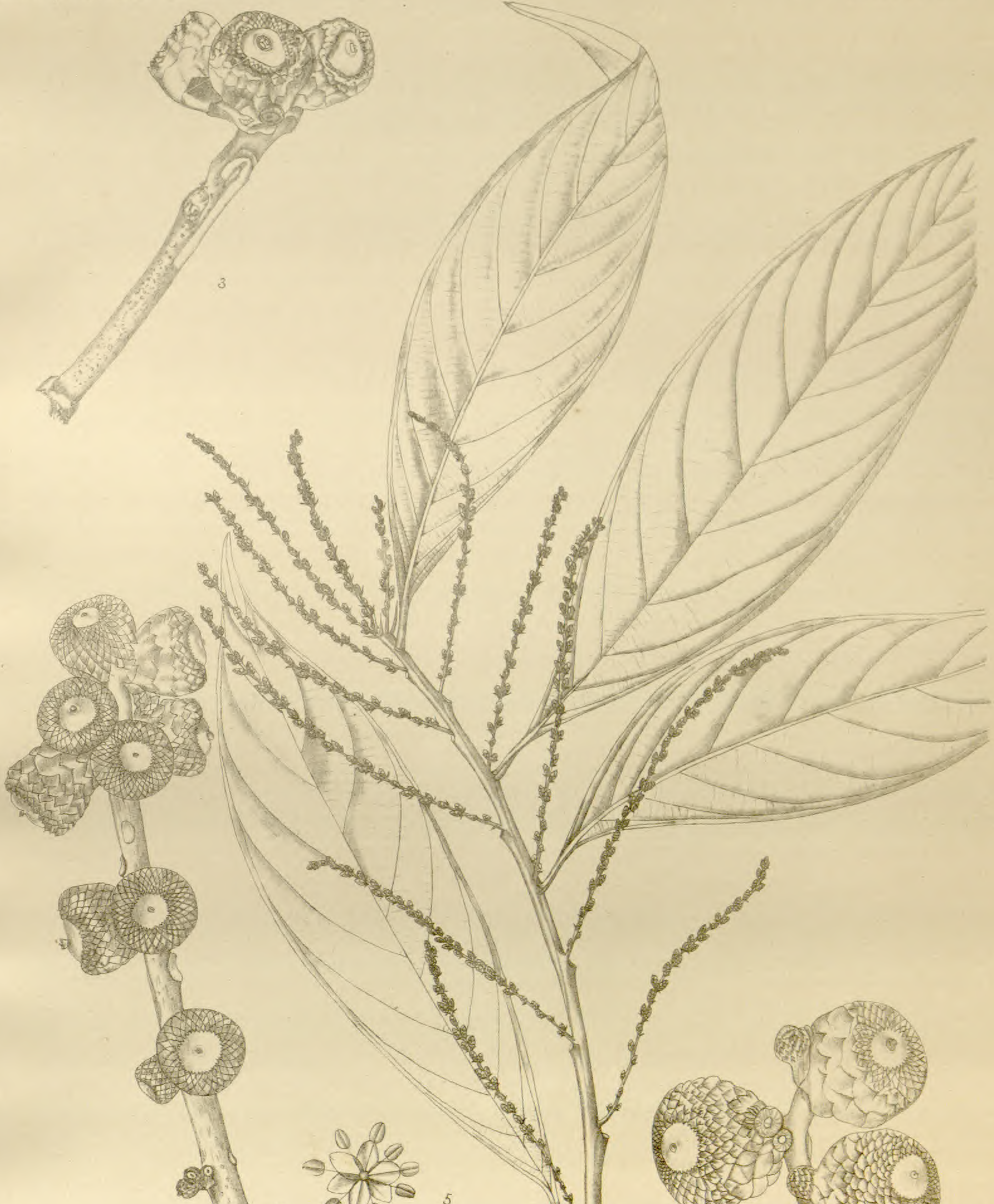
QUERCUS BECCARIANA, Benth.



G. C. Das, del. Bot. Garden Calcutta.

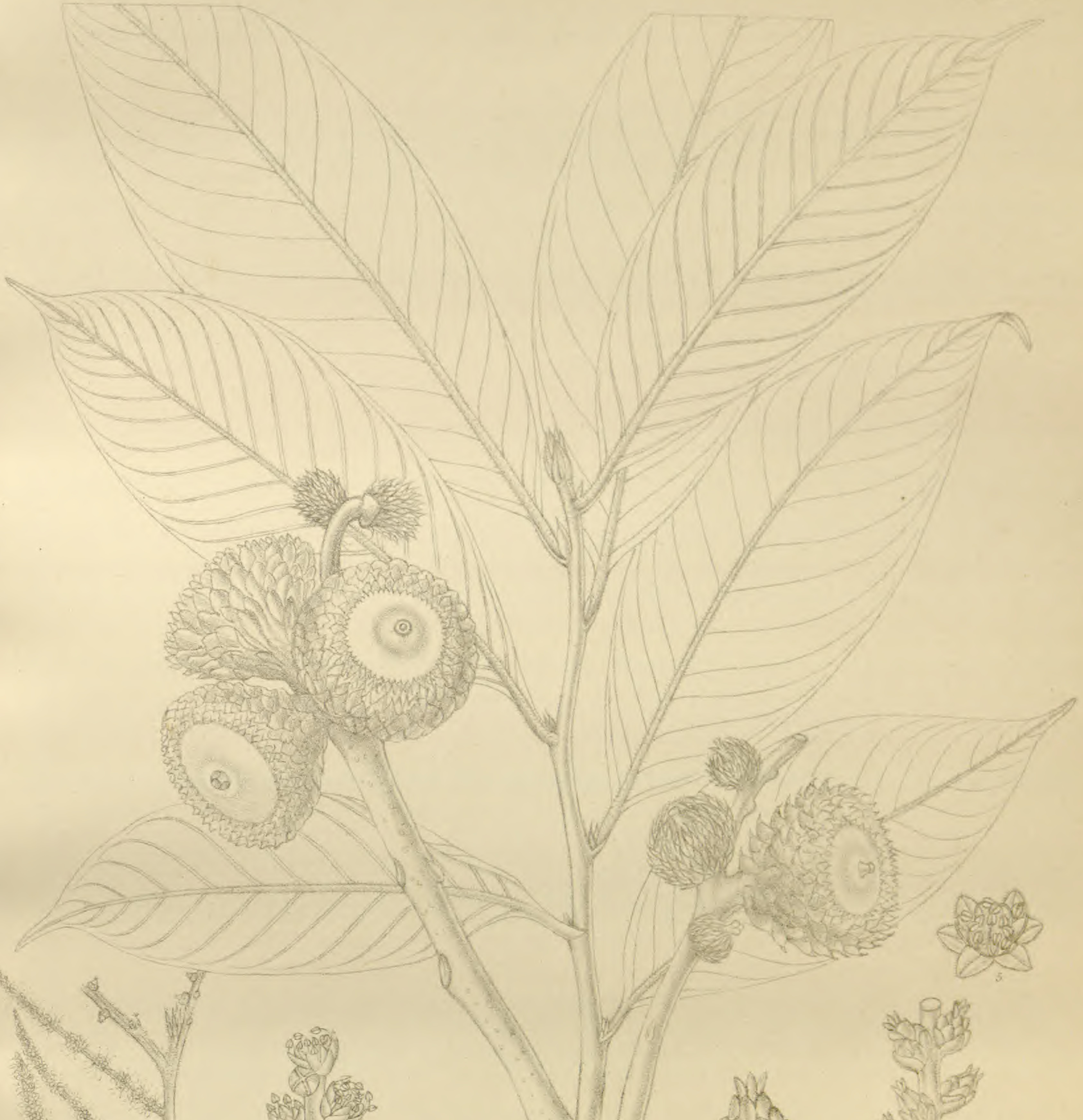
Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

QUERCUS XYLOCARPA, Kurz.



G. C. Das del. Bot. Garden, Calcutta.
Lith: by H. C. Datta, Govt: School of Art Calcutta.

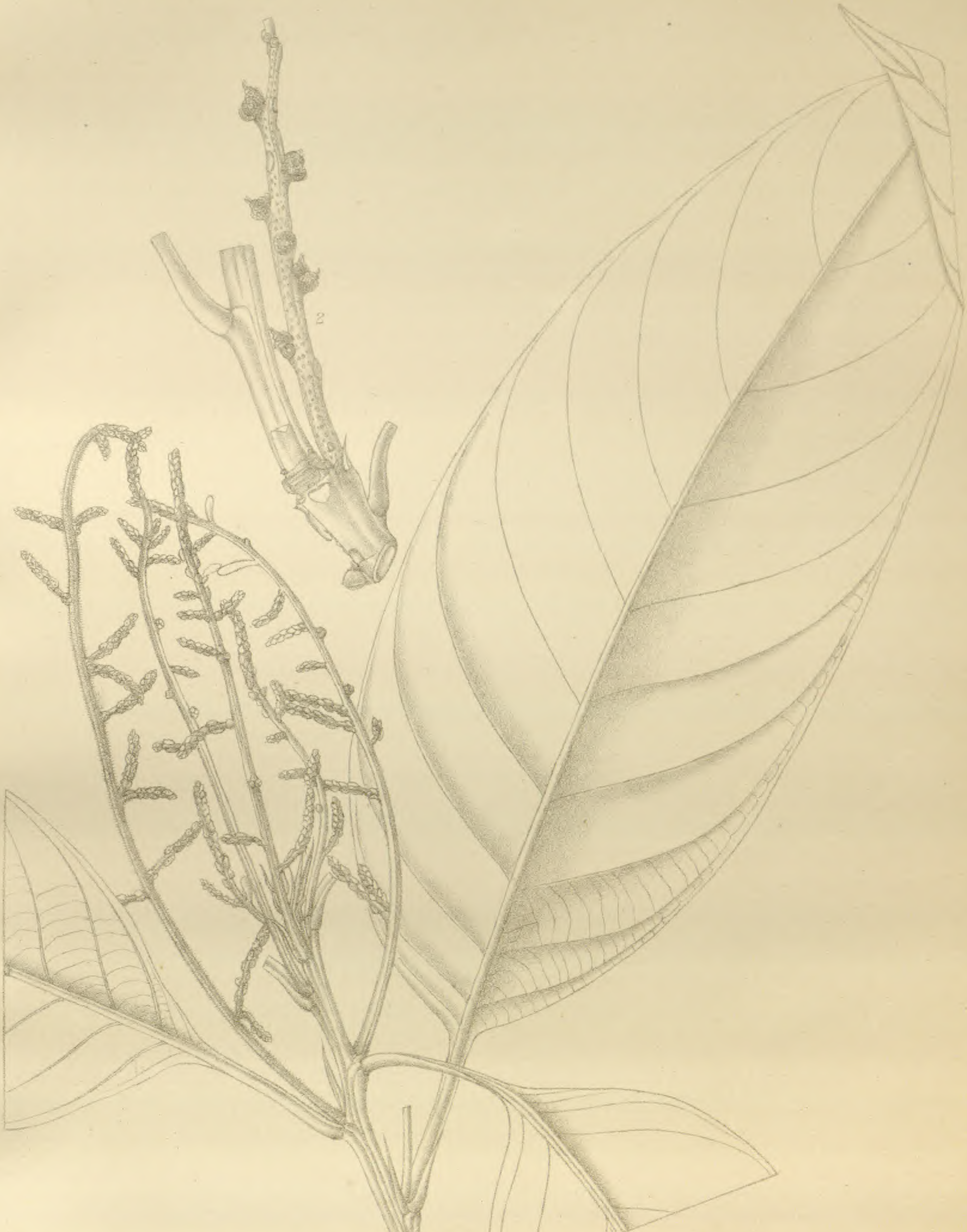
QUERCUS TRUNCATA, King



M. Smith, del.

Lith. by A. C. Singha, Govt. School of Art, Calcutta.

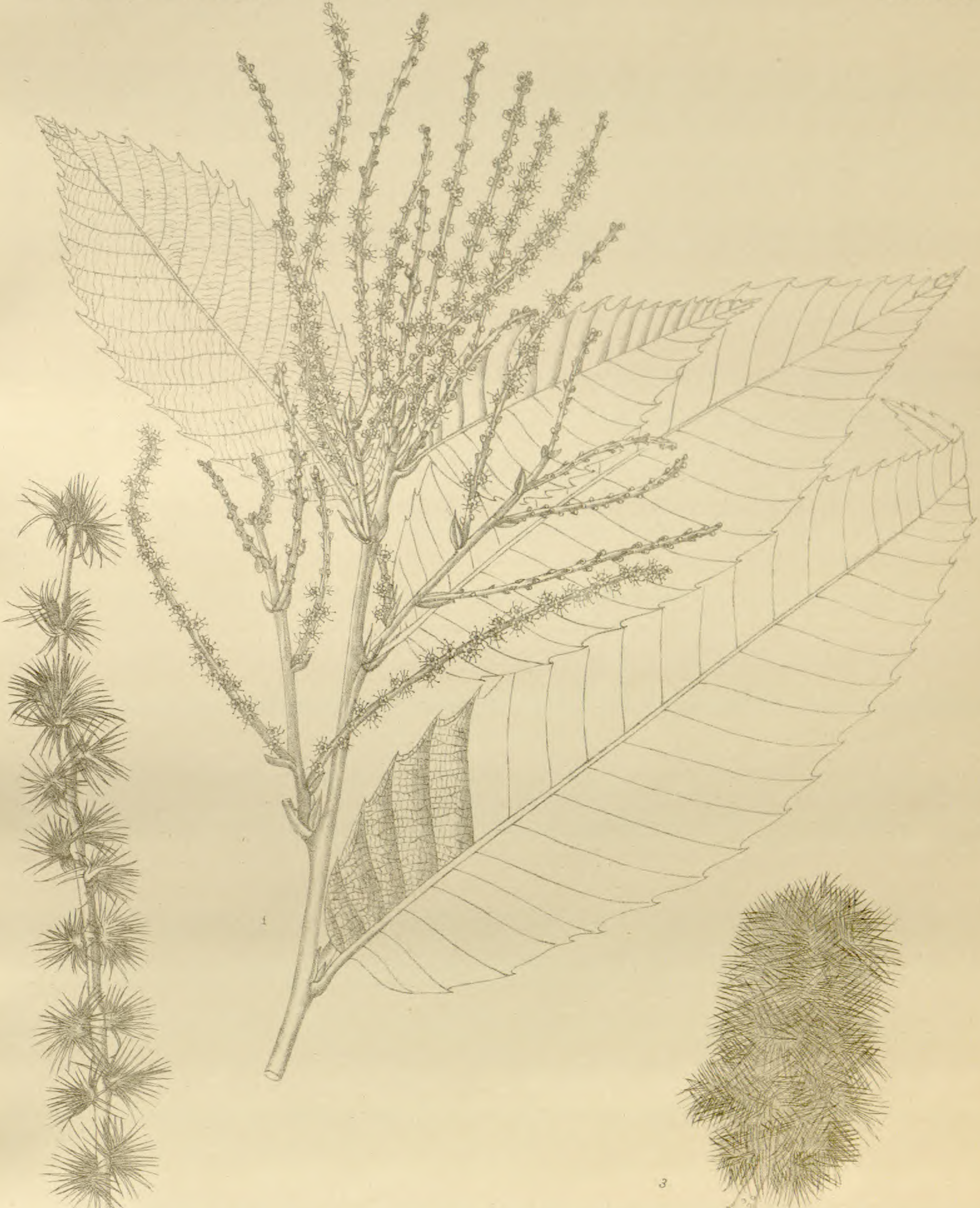
QUERCUS PULCHRA, King.



G. C. Das del. Bot. Garden, Calcutta.

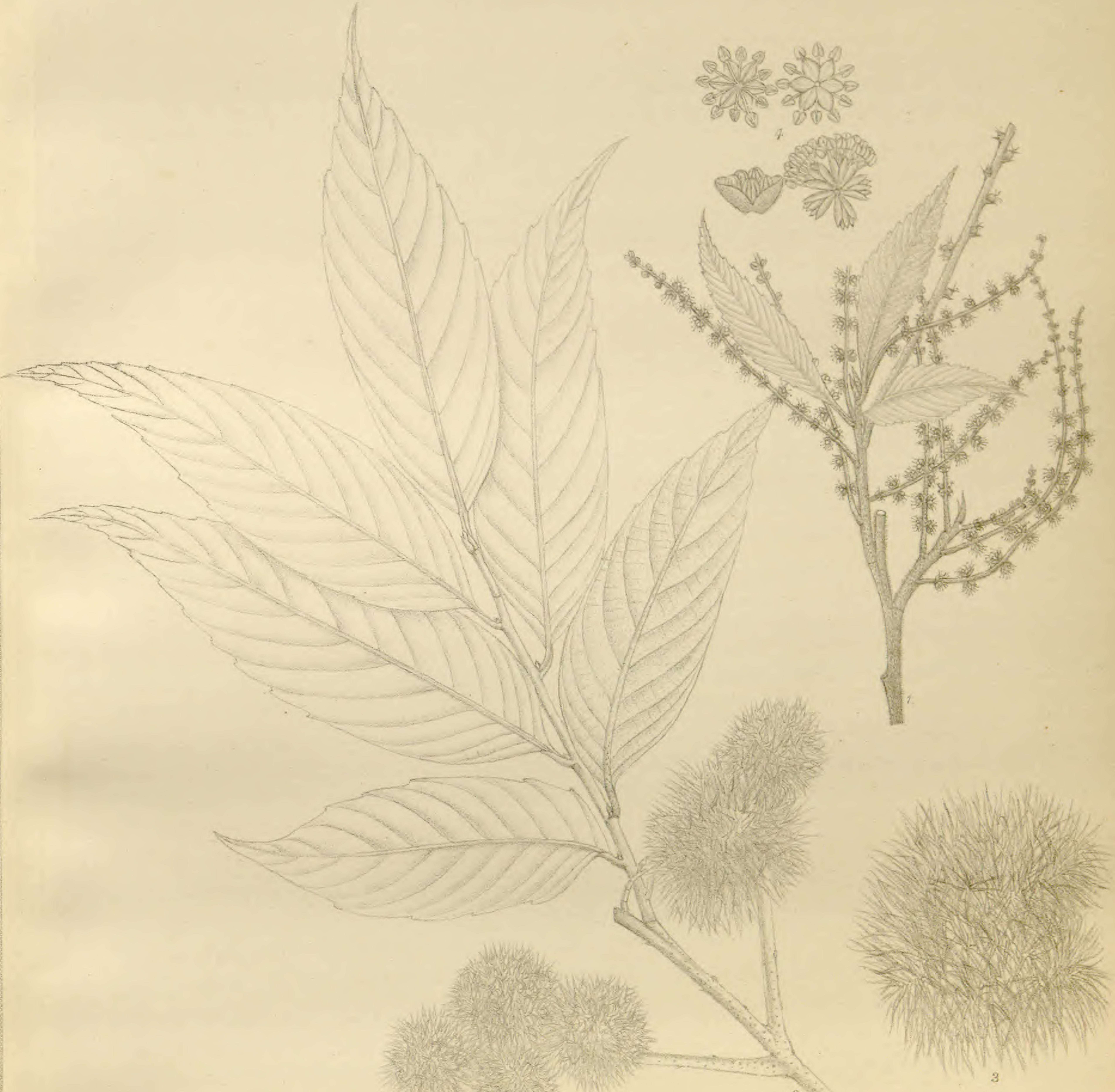
Lith. by A. C. Singha, Govt. School of Art, Calcutta.

QUERCUS LISTERI, King.



G.C.Das del.Bot.Garden, Calcutta
Lith. by H.C.Datta. Govt. School of Art. Calcutta.

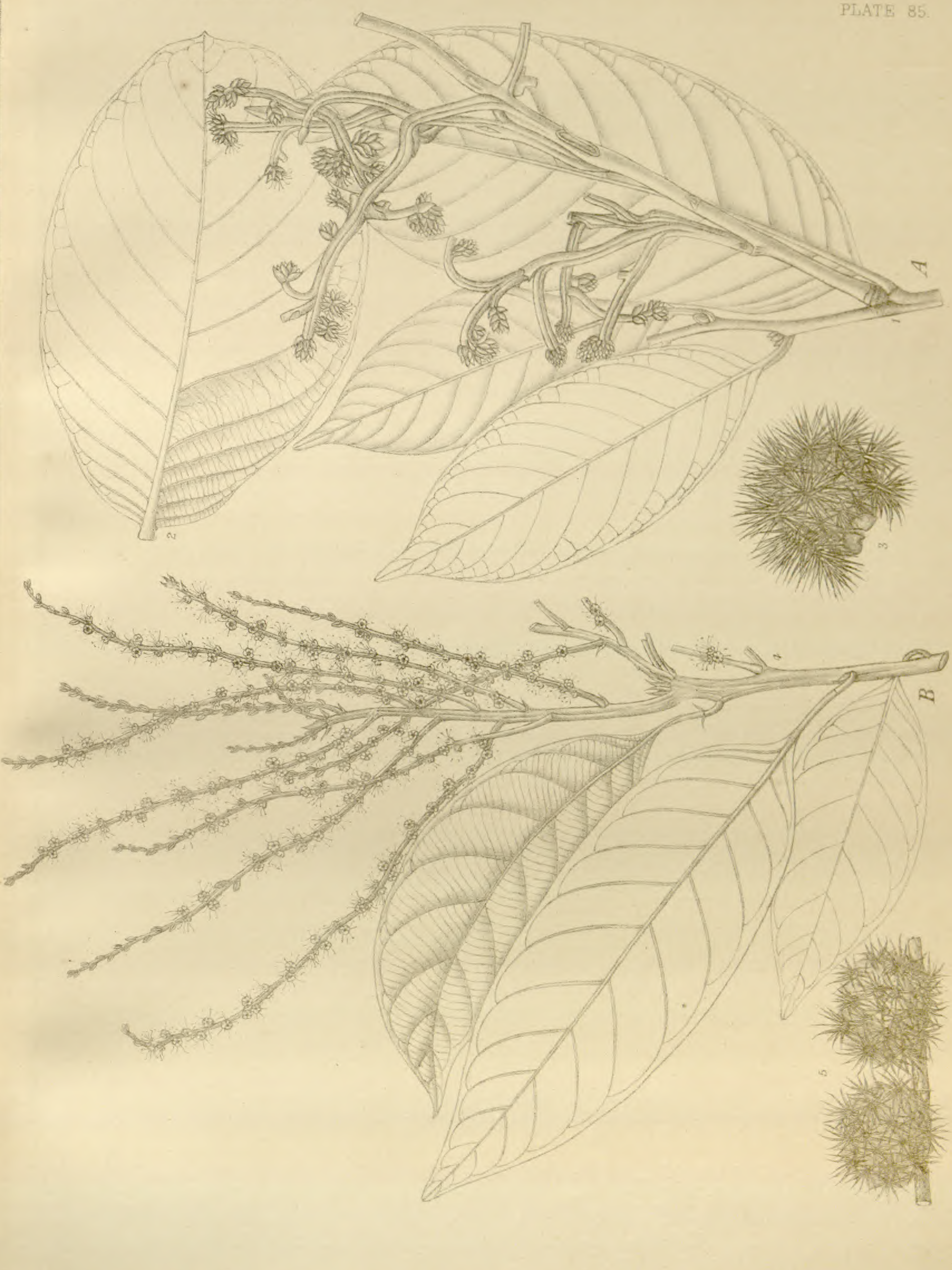
CASTANOPSIS INDICA, A.DC.



G. C. Das del. Bot. Garden, Calcutta

Lith by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

CASTANOPSIS HYSTRIX, A. DC.

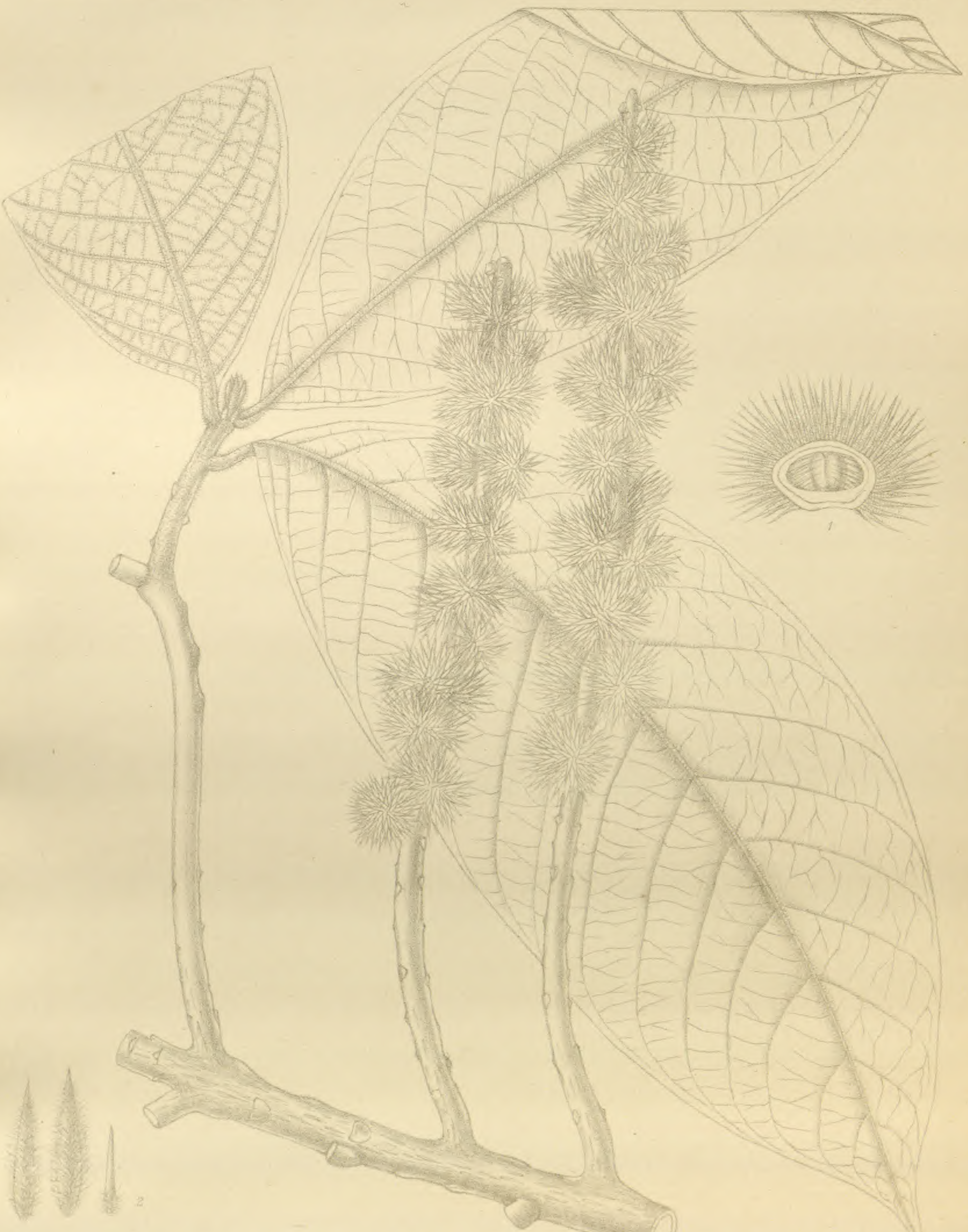


CASTANOPSIS DIVERSIFOLIA, King.

CASTANOPSIS ARGYROPHYLLA, King.

Lith. by J.C.Chuckerbutty, Govt. School of Art, Calcutta.

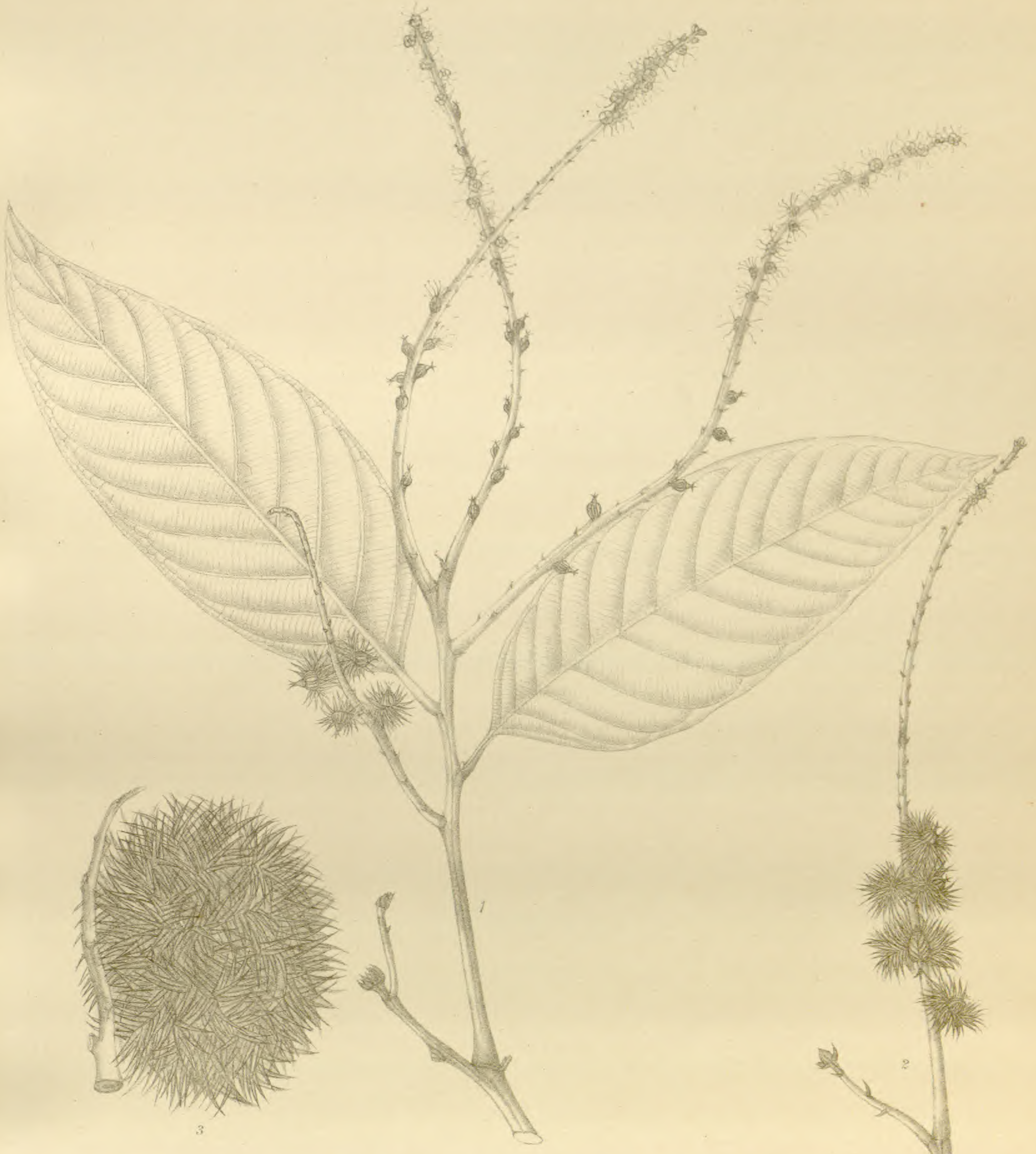
G.C.Das del. Bot. Garden, Calcutta.



M. Smith, del.

Lith by A. C. Singha, Govt. School of Art, Calcutta.

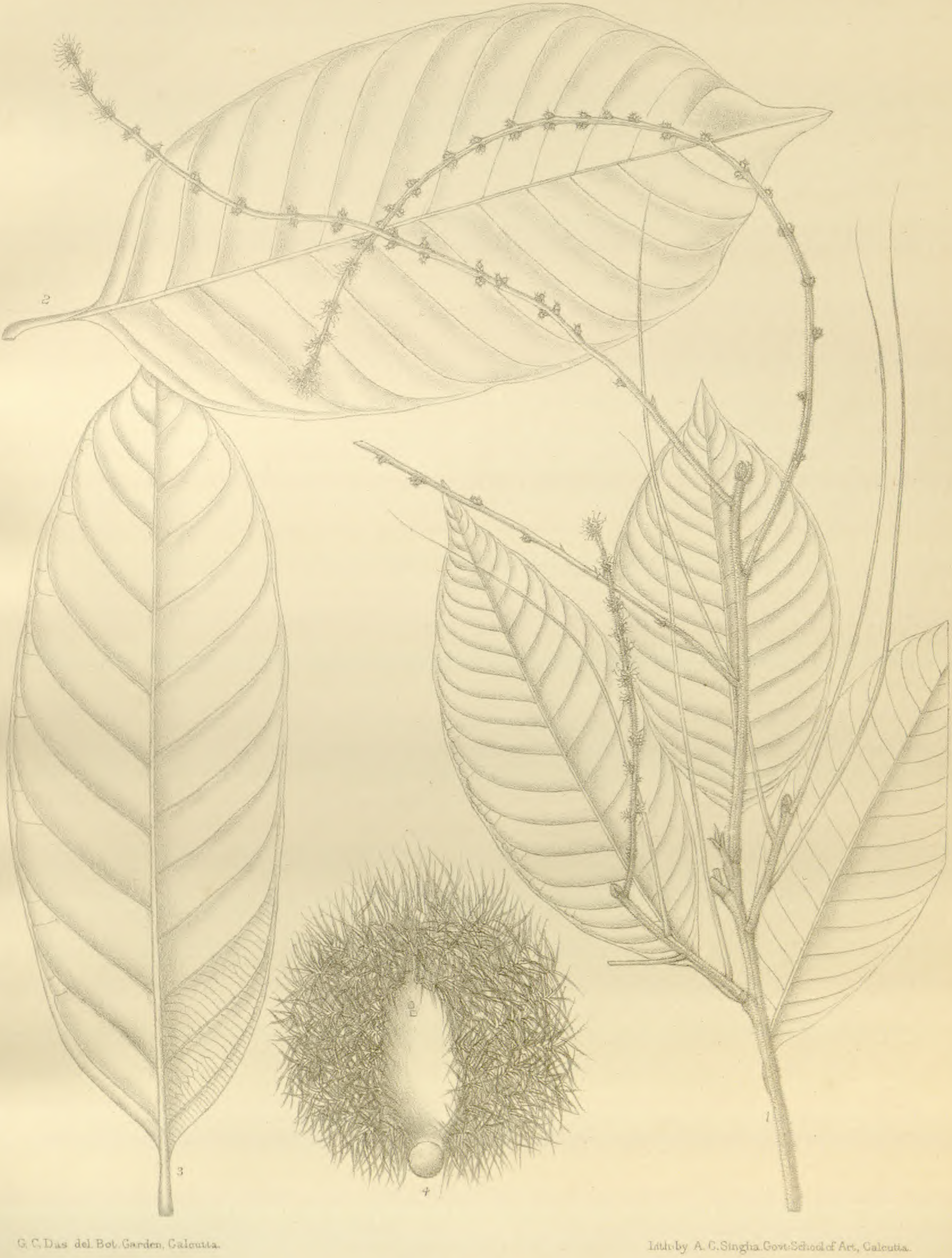
CASTANOPSIS MOTTLEYANA, King



G. C. Das, del. Bot. Garden Calcutta.

Lith: by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

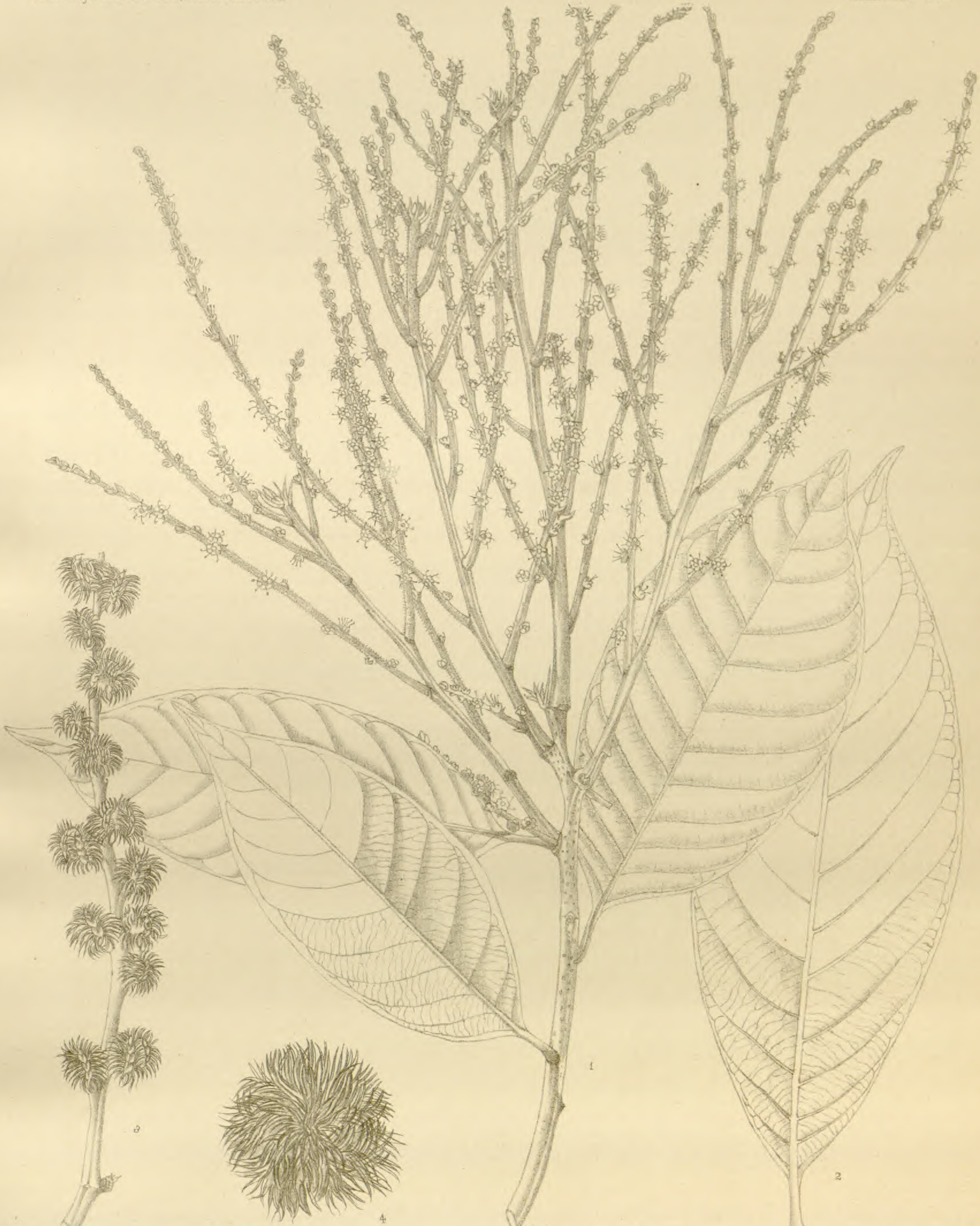
CASTANOPSIS TUNGURRUT, A. DC.



G. C. Das del. Bot. Garden, Calcutta.

Lith. by A. C. Singha. Govt. School of Art, Calcutta.

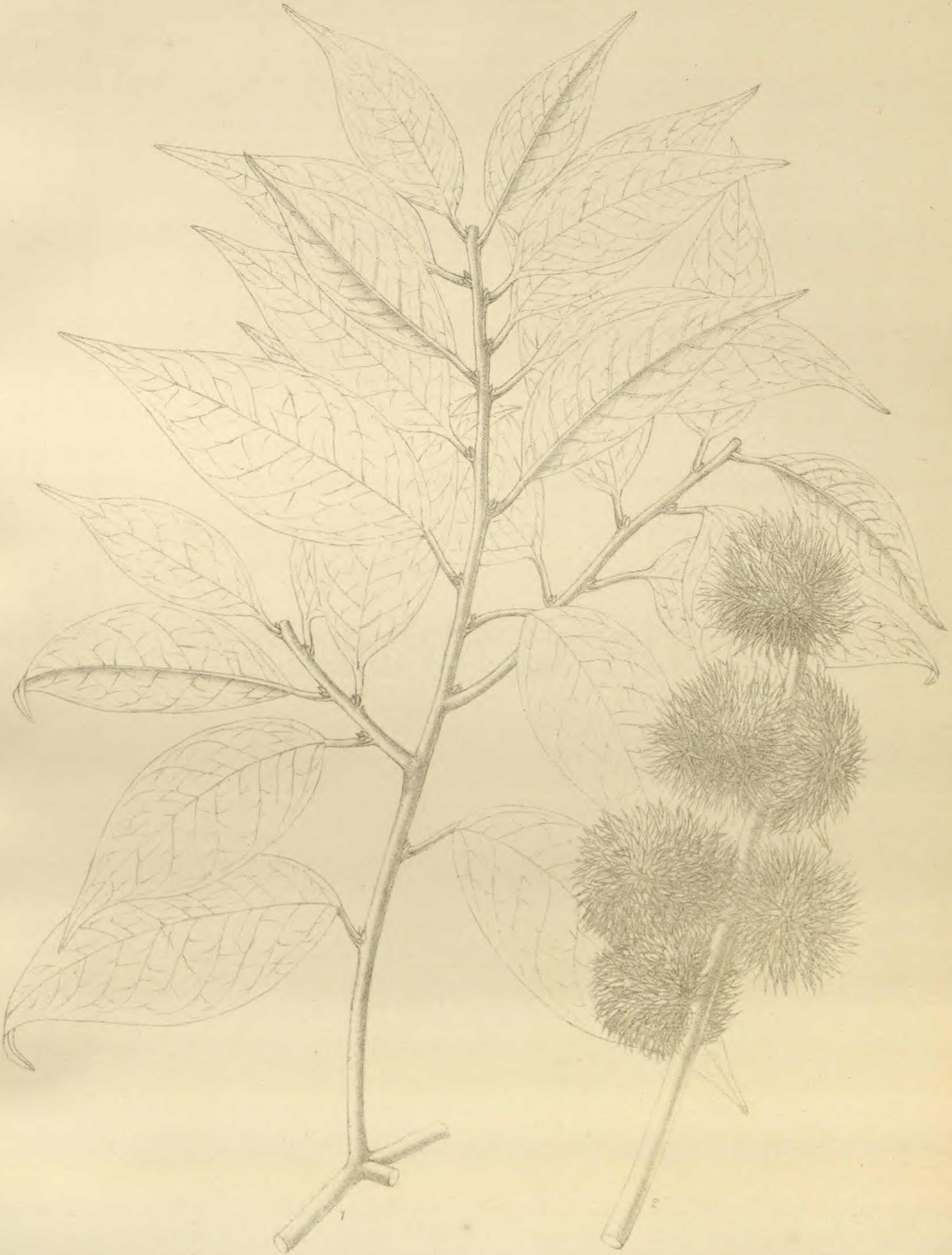
CASTANOPSIS JAVANICA, A. DC



G.C Das del. Bot. Garden. Calcutta.

Lith. by H.C. Datta. Govt. School of Art Calcutta.

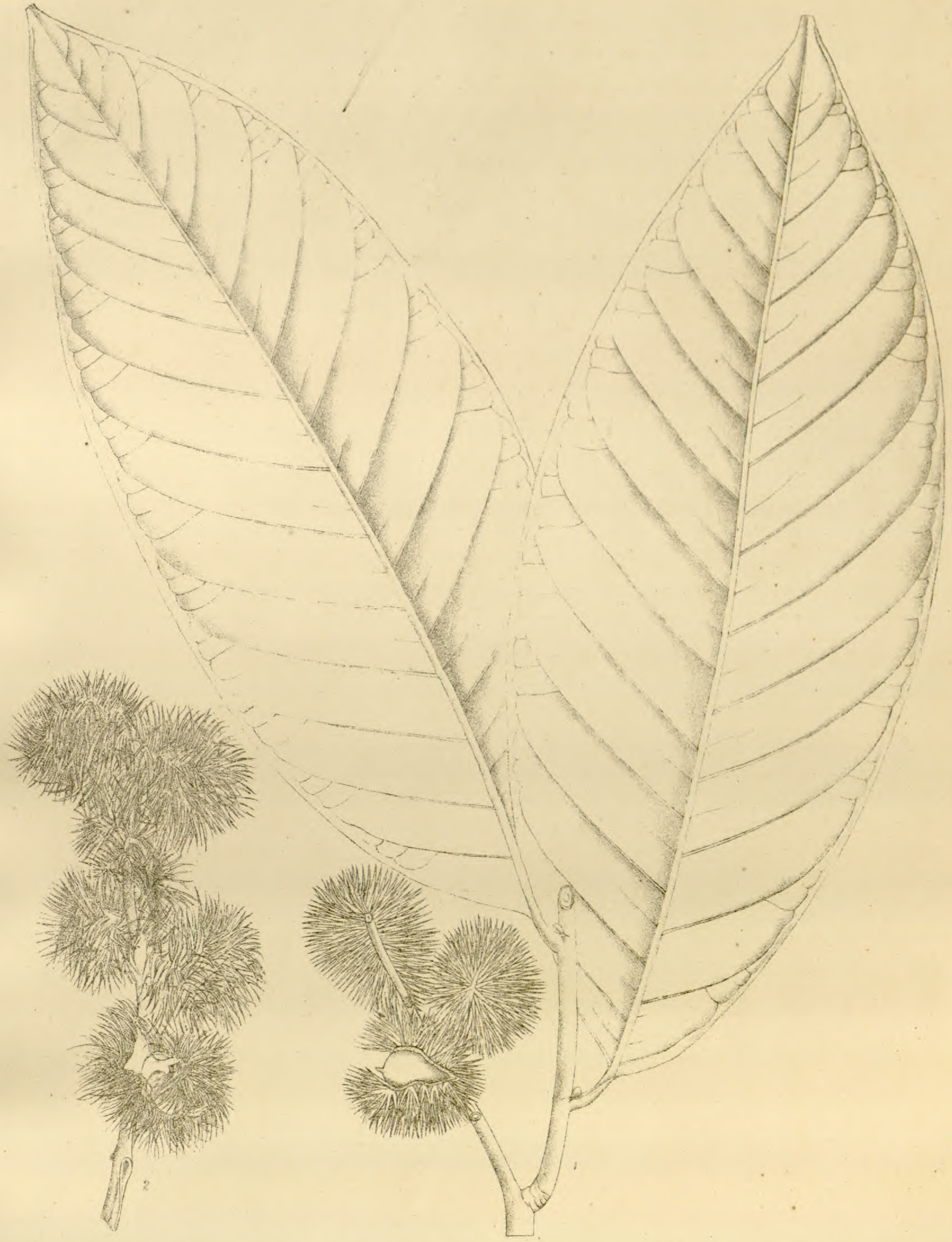
CASTANOPSIS ARGENTEA, A.DC.



M. Smith del.

Lith. by K. P. Das, Govt. School of Art, Calcutta.

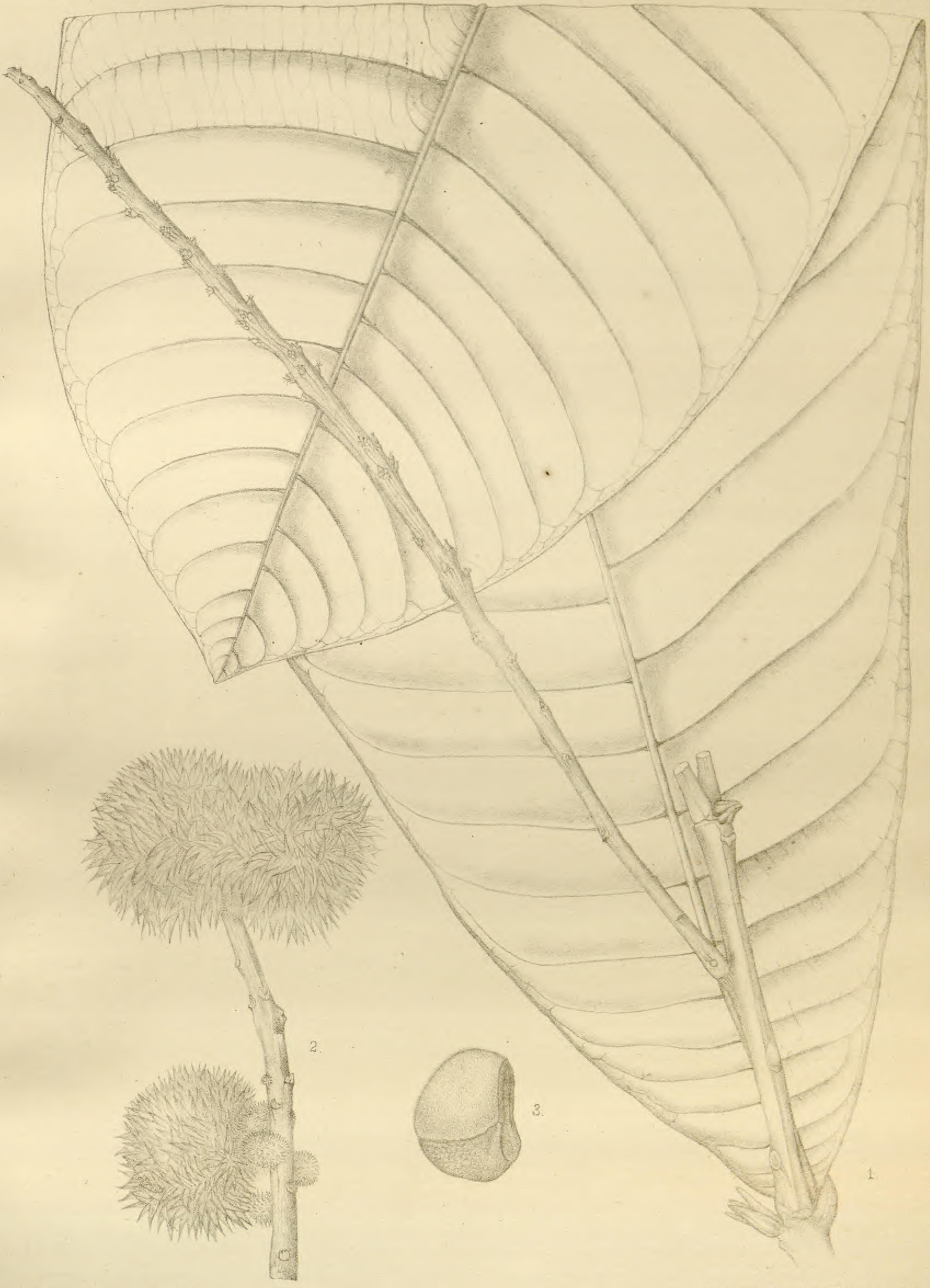
CASTANOPSIS BORNEENSIS, King.



A. D. Molla

Lith: by B. B. Das, Govt. School of Art, Calcutta.

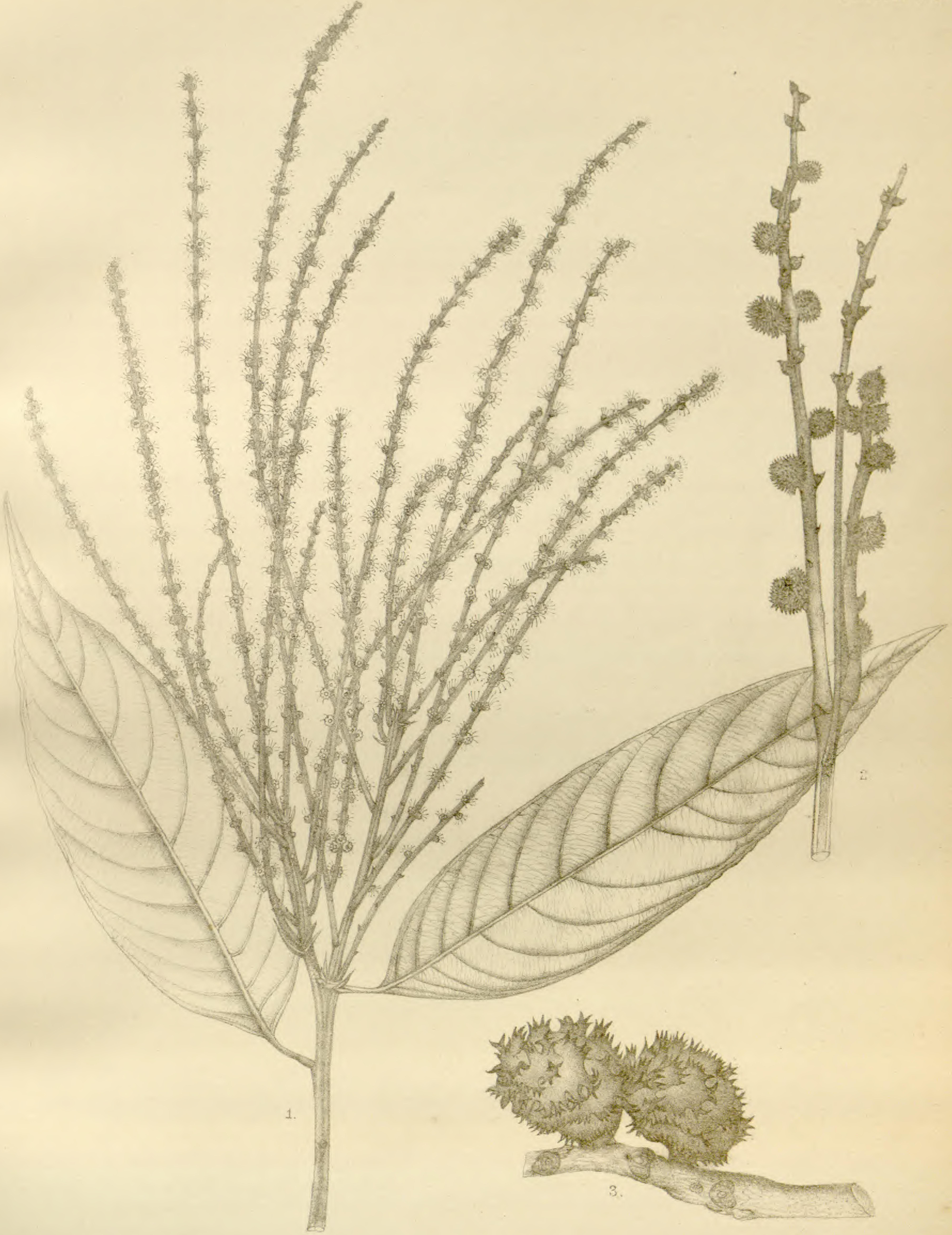
CASTANOPSIS CASTANICARPA, Spach.



G. C. Das del. Bot. Garden, Calcutta

Lith: and Printed by Kristohari Das.

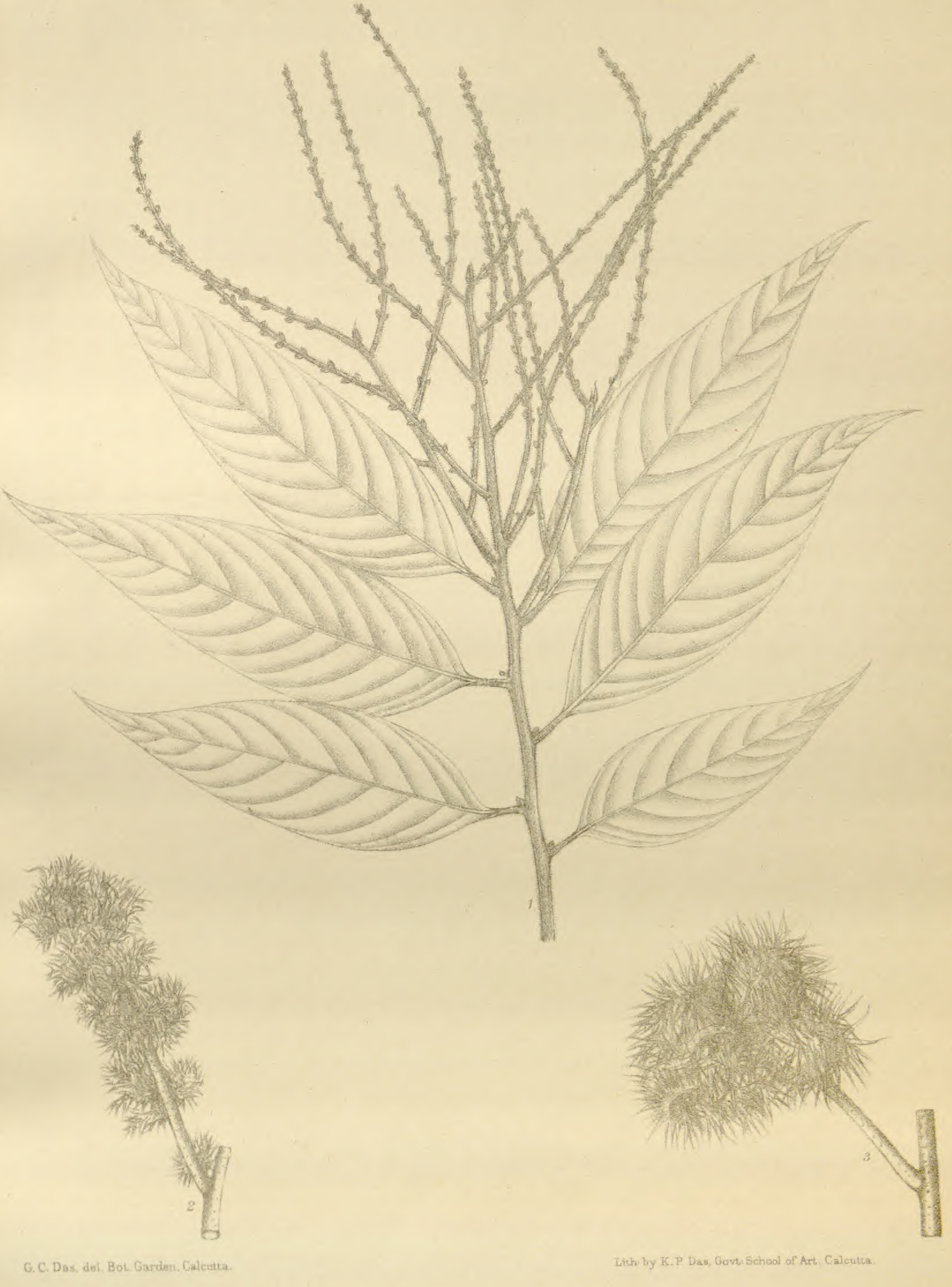
CASTANOPSIS CATAPPAEFOLIA, King.



G. C. Das del. Bot. Garden, Calcutta.

Lith. and Printed by Kristohari Das.

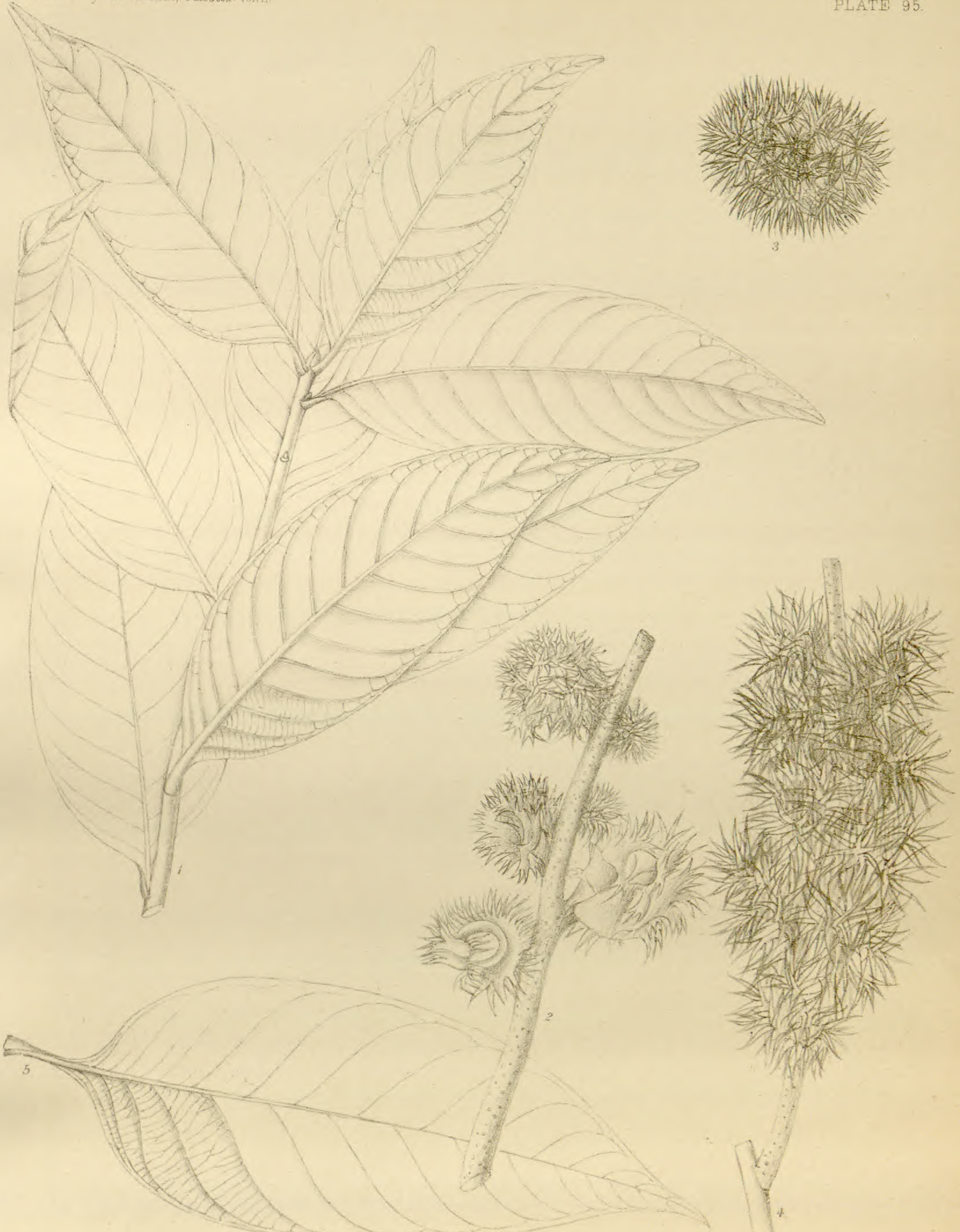
CASTANOPSIS ARMATA, Spach.



G. C. Das, del. Bot. Garden, Calcutta.

Lith. by K. P. Das, Govt. School of Art, Calcutta.

CASTANOPSIS TRIBULOIDES, A. DC.

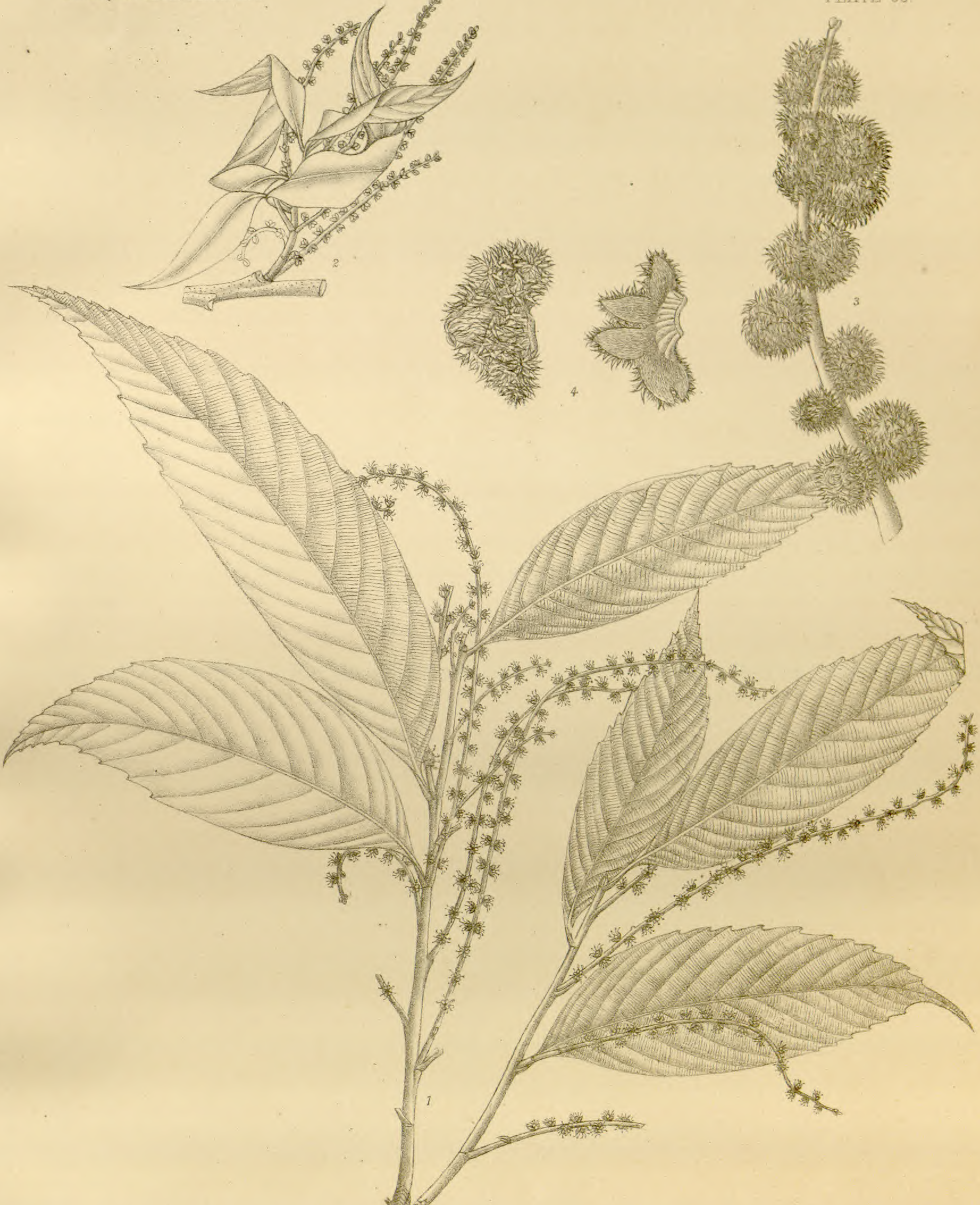


G. C. Das del. Bot. Garden, Calcutta.

Lith. by A. C. Sing'ha, Govt. School of Art, Calcutta.

CASTANOPSIS TRIBULOIDES, A.DC.

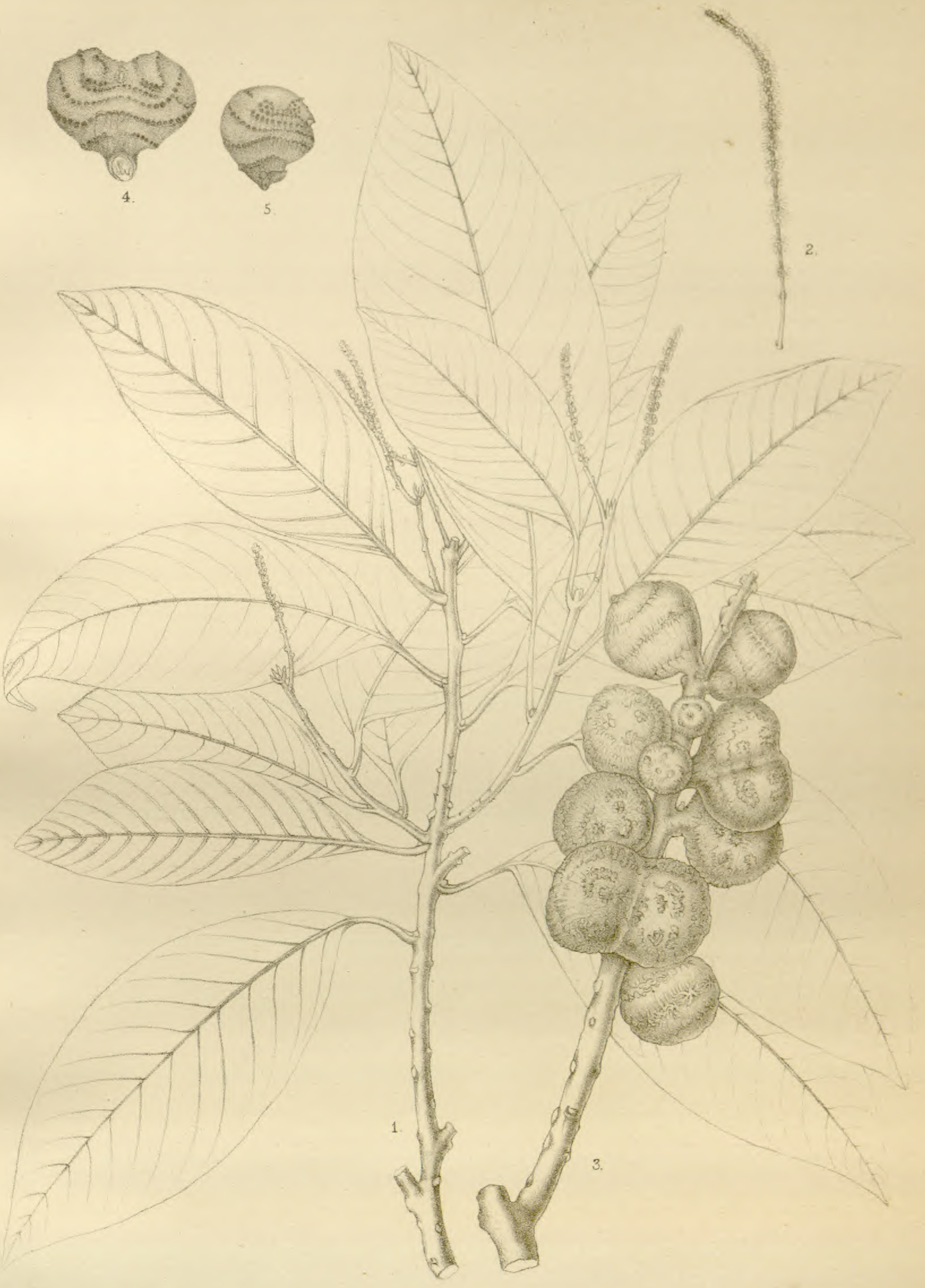
1 and 2 Var. ferox. 3 to 5 Var. longispina



A. D. Molla.

Lith. by. K. P. Das, Govt. School of Art, Calcutta.

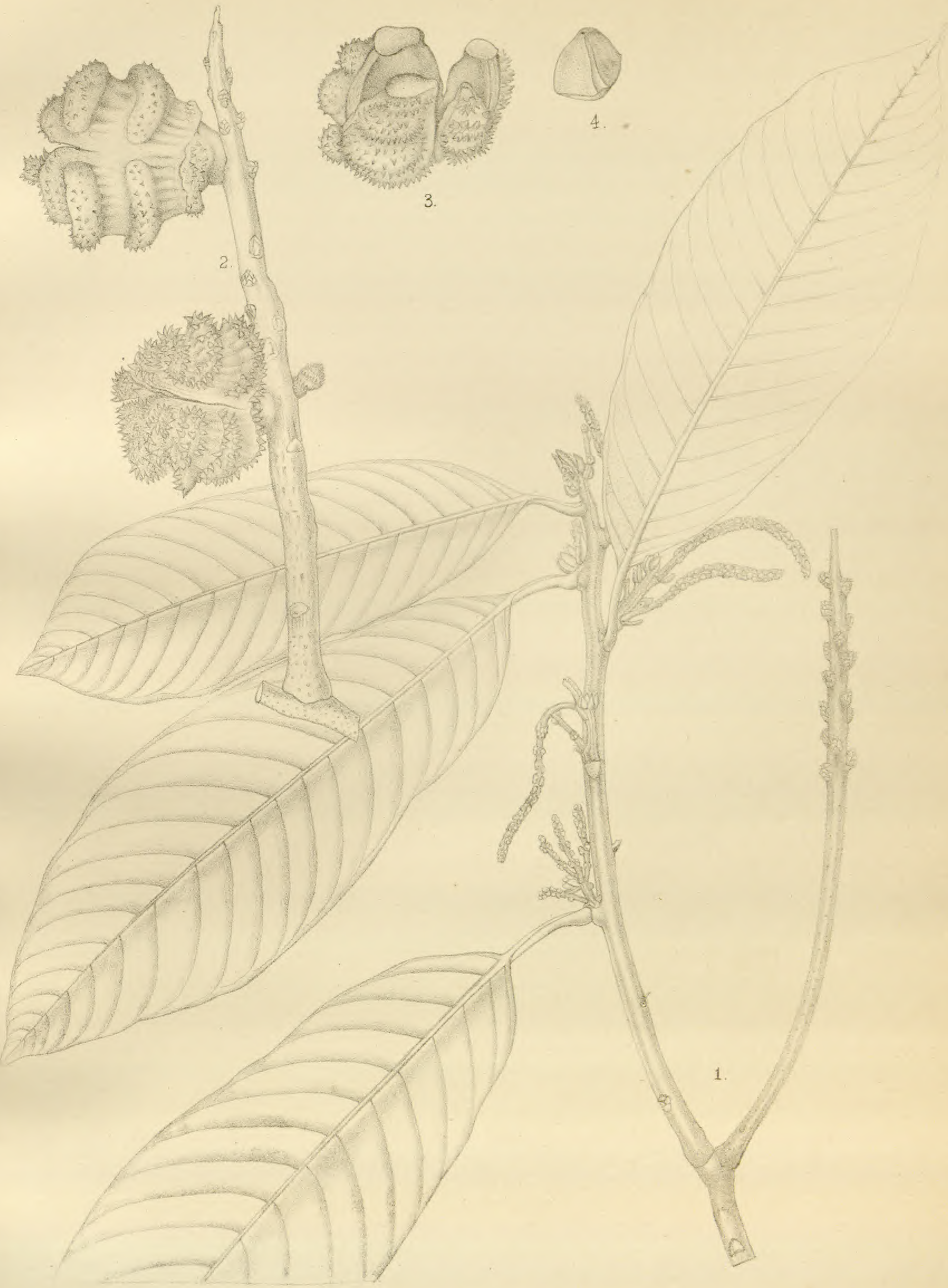
CASTANOPSIS TRIBULOIDES, A. DC. 1 to 3 var. echidnocarpa. 4 var. Wattii.



M. Smith del.

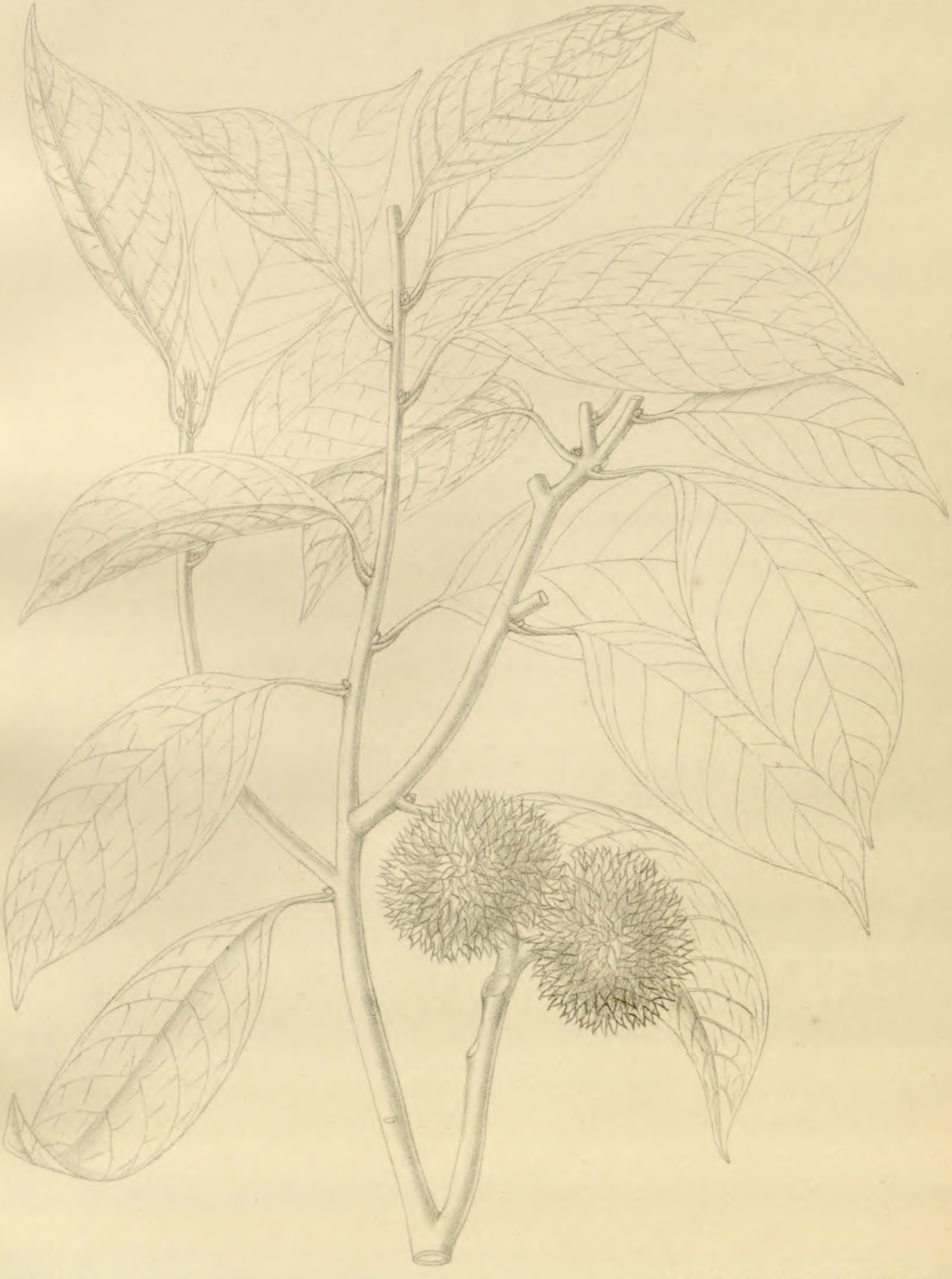
Lith. and Printed by Kristchari Das.

CASTANOPSIS SUMATRANA, ADC.



G. C. Das, del. Bot. Garden, Calcutta.
Lith. and Printed by Kristohari Das

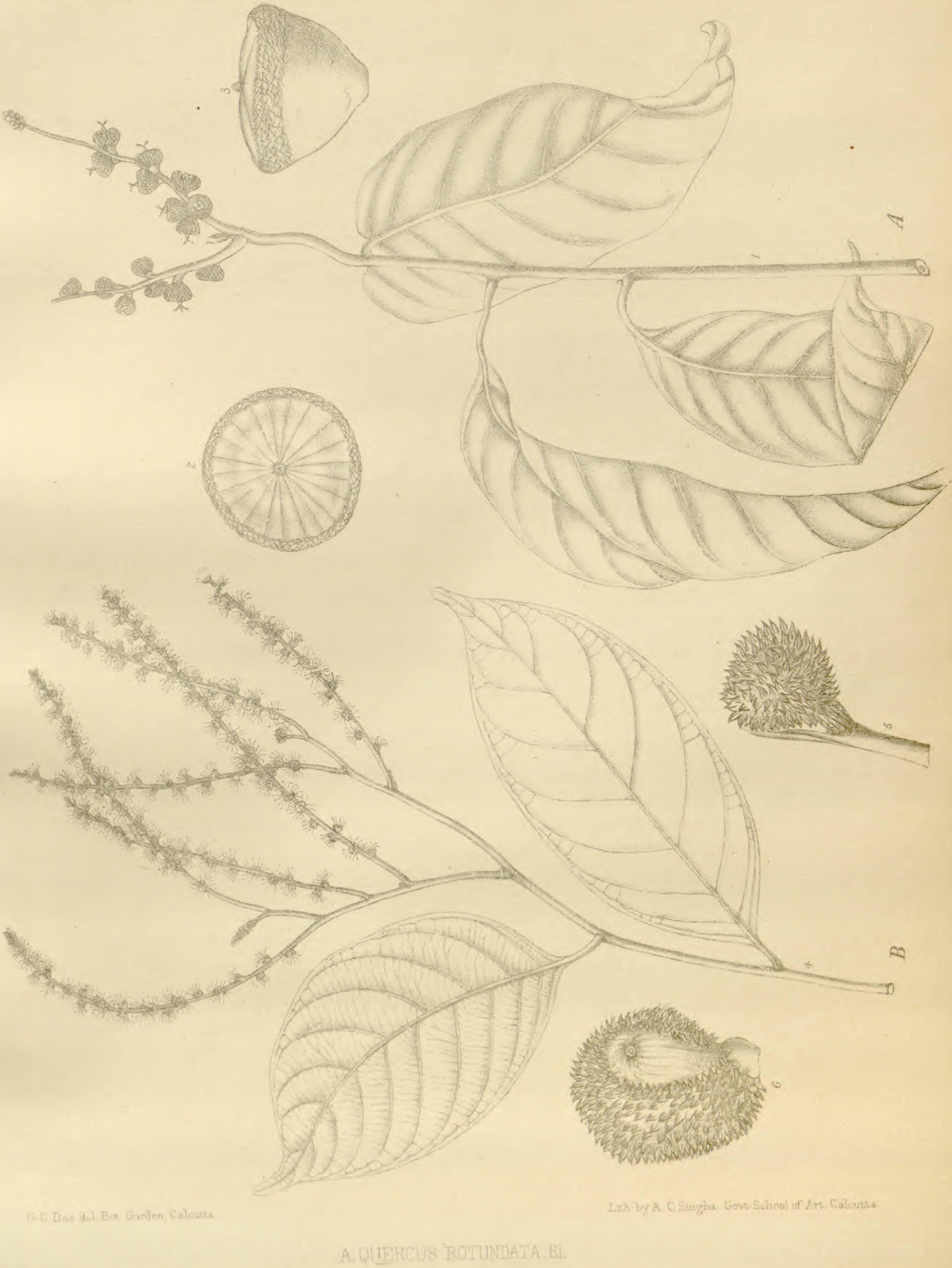
CASTANOPSIS HULLETTII, King.



M. Smith del.

Lith. by A. C. Singha, Govt. School of Art, Calcutta.

CASTANOPSIS SCHEFFERIANA, Hance.

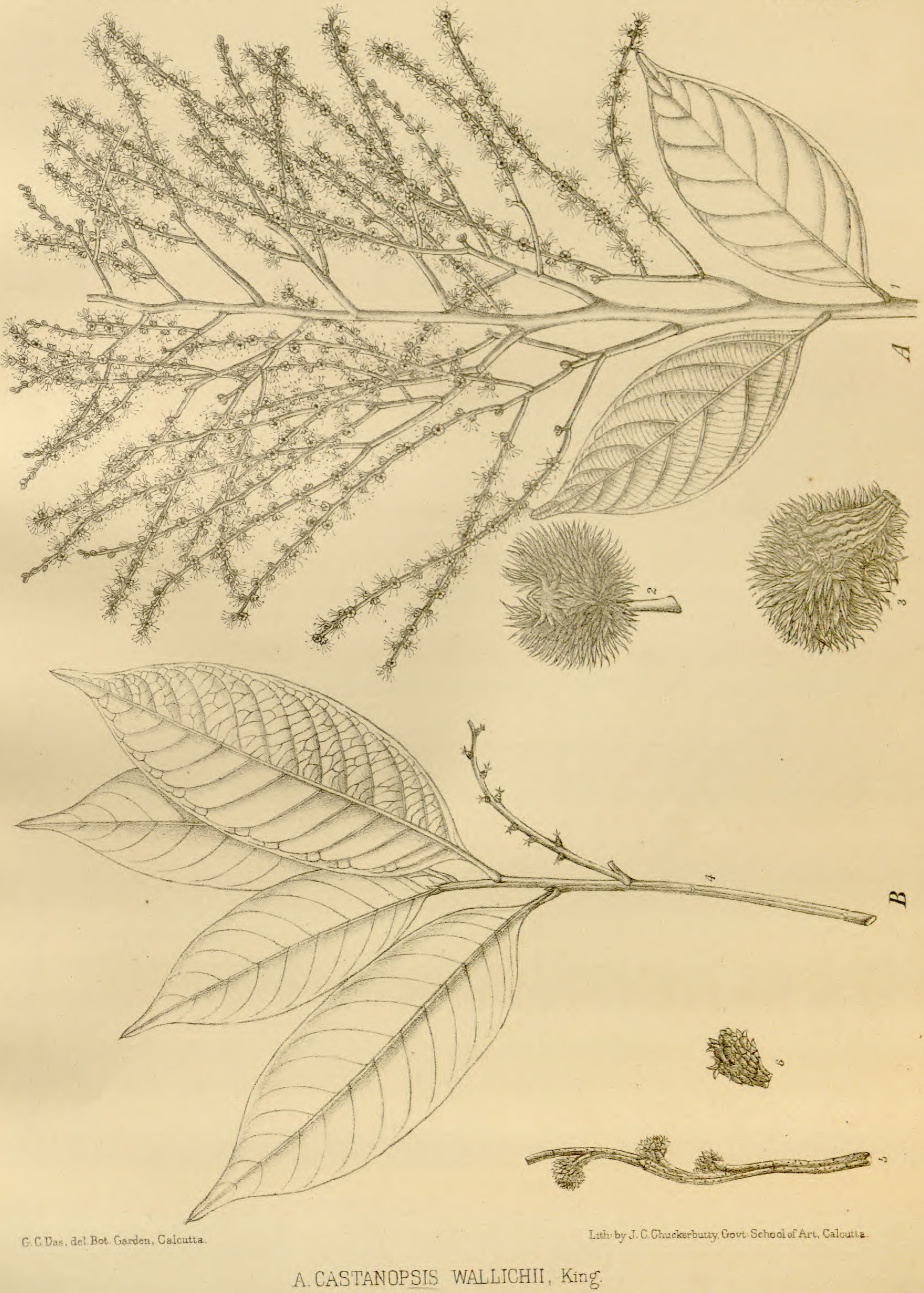


G. C. Das del. Bot. Garden, Calcutta.

Lith by A. C. Singha. Govt. School of Art, Calcutta.

A. QUERCUS ROTUNDATA. Bl.

B. CASTANOPSIS RHAMNIFOLIA. A. DC.

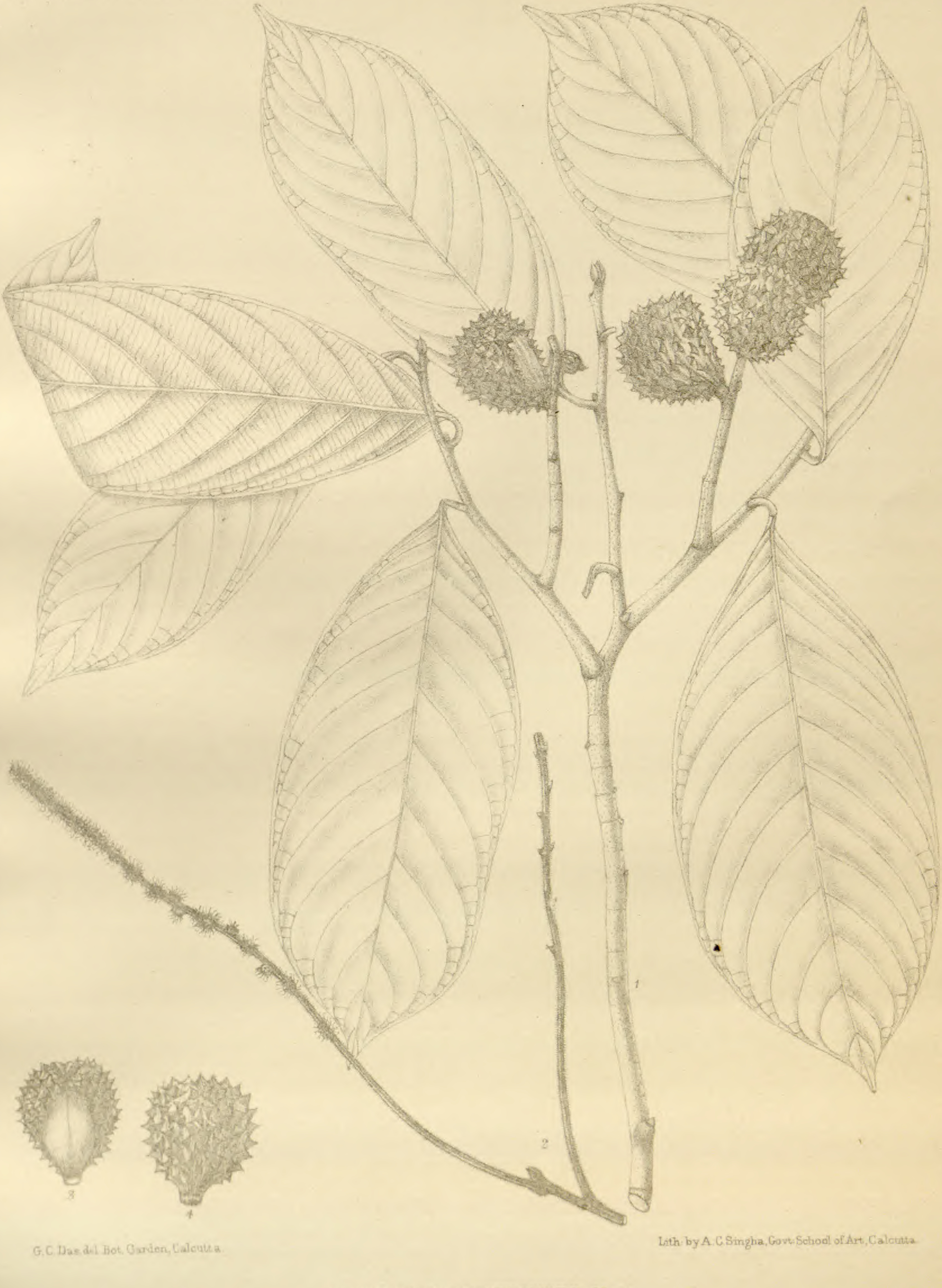


G. C. Das, del. Bot. Garden, Calcutta.

Lith: by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

A. CASTANOPSIS WALLICHII, King.

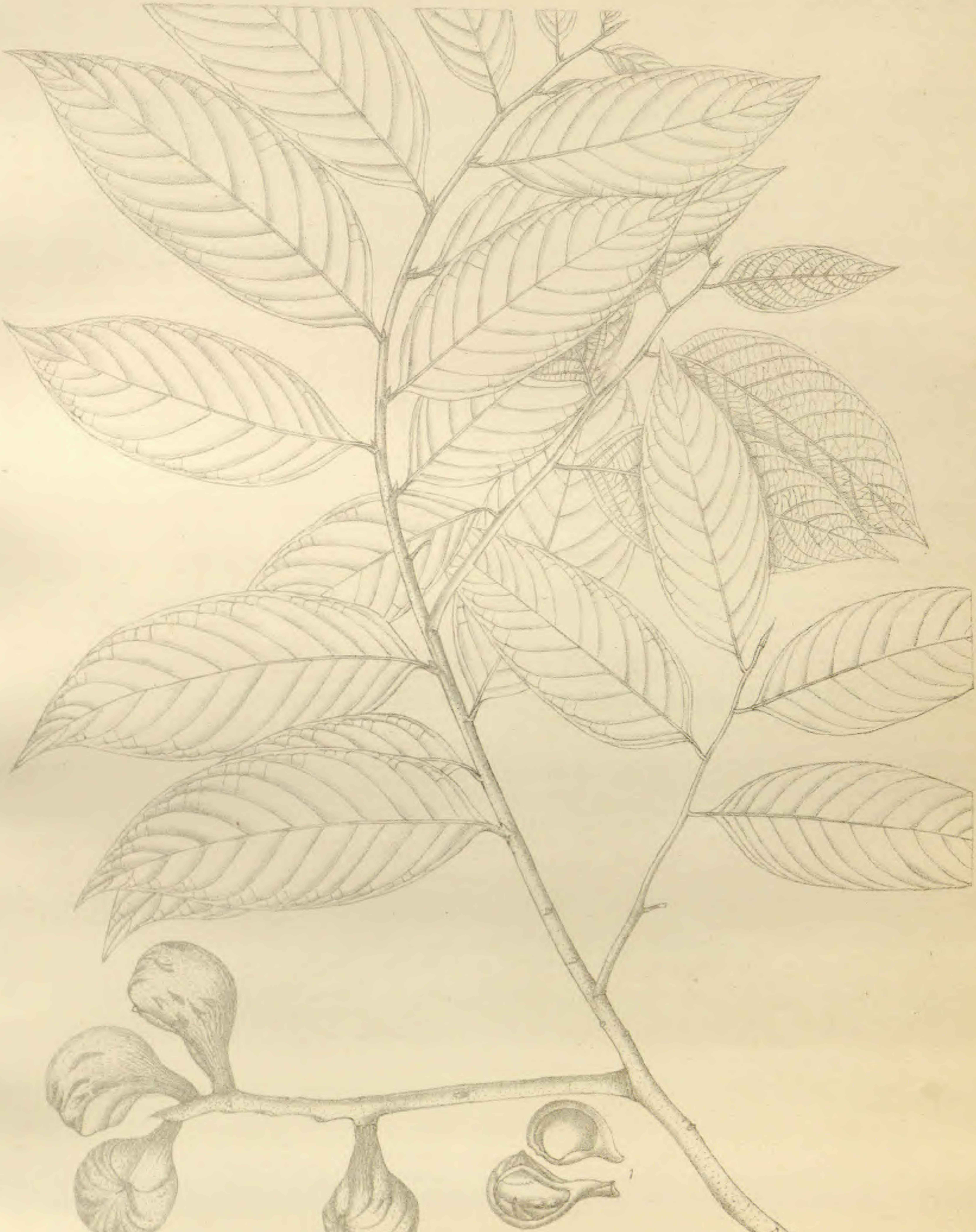
B. " BURUANA, Miq.



G. C. Das del. Bot. Garden, Calcutta.

Lith. by A. C. Singha, Govt. School of Art, Calcutta.

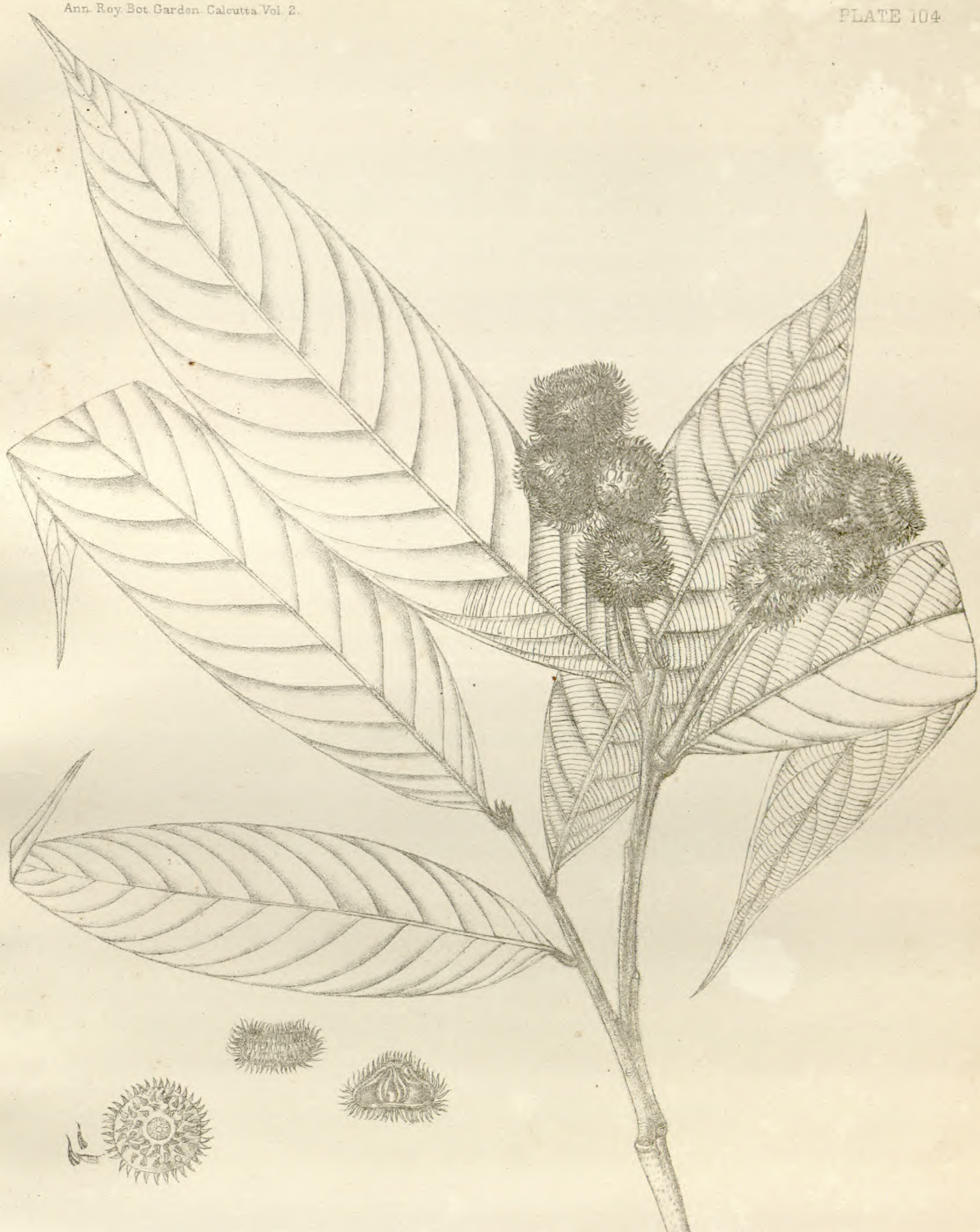
CASTANOPSIS NEPHELIOIDES, King.



G. C. Das del. Bot. Garden, Calcutta

Lith by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

CASTANOPSIS CURTISII, King.



G.C. Das. del. Bot. Garden, Calcutta.

Lith. by J. C. Chuckerbutty, Govt. School of Art, Calcutta.

QUERCUS WRAYI, King.